

**EPA Superfund
Record of Decision:**

**CIBA-GEIGY CORP. (MCINTOSH PLANT)
EPA ID: ALD001221902
OU 02
MCINTOSH, AL
09/30/1991**

SEP 30, 1991

DECISION SUMMARY

OPERABLE UNIT TWO, CIBA-GEIGY SITE MCINTOSH, WASHINGTON COUNTY, ALABAMA

#SLD

1.0 SITE LOCATION AND DESCRIPTION

THE CIBA-GEIGY CORPORATION MCINTOSH FACILITY IS LOCATED IN SOUTHERN WASHINGTON COUNTY, NORTHEAST OF MCINTOSH, ALABAMA, APPROXIMATELY 50 MILES NORTH OF MOBILE, ALABAMA (FIGURE 1). THE OPERATING FACILITY IS LOCATED AT 31 DEGREE 15'00" NORTH LATITUDE AND 87 DEGREE 58'00" WEST LONGITUDE. THE OPERATING FACILITY, WHICH ENCOMPASSES APPROXIMATELY 2.4 SQUARE MILES, IS SITUATED BETWEEN THE SOUTHERN RAILROAD RIGHT-OF-WAY ON THE WEST AND EXTENDS NEARLY TO THE ESCARPMENT SEPARATING THE UPLAND TERRACE FROM THE FLOODPLAIN OF THE TOMBIGBEE RIVER. THE PROPERTY BOUNDARIES EXTEND BEYOND THE RAILROAD WESTWARD TOWARD US HIGHWAY 43. THE NORTHERN EDGE OF THE PROPERTY MERGES INTO AN UNDEVELOPED PINE FOREST. TO THE SOUTH THE PROPERTY IS BOUNDED BY OLIN CORPORATION FACILITY. THE SOUTHEASTERN PORTION OF THE PROPERTY EXTENDS TO THE BANKS OF THE TOMBIGBEE RIVER.

THE FACILITY IS LOCATED IN AN INDUSTRIAL SETTING. THE CIBA-GEIGY SUPERFUND SITE ("SITE") IS CONTIGUOUS WITH THE FACILITY BOUNDARY. THE AREAS OF CONTAMINATION (AOCS) ADDRESSED BY THIS ROD ARE LOCATED ON THE MCINTOSH FACILITY DUE EAST OF THE CURRENT PRODUCTION AREA. THE AOCS ARE ROUGHLY DIVIDED BY THE RIVER WATER RESERVOIR (SEE FIGURE 2). THE NEAREST POPULATION CENTER IS THE TOWN OF MCINTOSH, WHICH IS LOCATED APPROXIMATELY TWO MILES TO THE SOUTHWEST.

1.1 SITE HISTORY AND ENFORCEMENT ACTIVITIES

THE CIBA-GEIGY MCINTOSH FACILITY, FORMERLY OWNED BY GEIGY CHEMICAL CORPORATION, BEGAN OPERATIONS IN OCTOBER 1952, WITH THE MANUFACTURE OF ONE PRODUCT, DICHLORODIPHENYL-TRICHLOROETHANE (DDT). THROUGH 1970, GEIGY EXPANDED ITS MCINTOSH FACILITIES BY ADDING THE PRODUCTION OF FLUORESCENT BRIGHTENERS USED IN LAUNDRY PRODUCTS; HERBICIDES; INSECTICIDES; AGRICULTURAL CHELATING AGENTS; AND SEQUESTERING AGENTS FOR INDUSTRY.

IN 1970, GEIGY MERGED WITH CIBA (CHEMICAL INDUSTRY IN BASEL, SWITZERLAND), FORMING THE CIBA-GEIGY CORPORATION. SINCE THEN CIBA-GEIGY HAS CONTINUED TO EXPAND ITS OPERATIONS WITH THE ADDED PRODUCTION OF RESINS AND ADDITIVES USED IN THE PLASTICS INDUSTRY, ANTI-OXIDANTS, AND SMALL-VOLUME SPECIALTY CHEMICAL PRODUCTS (I.E. WATER TREATMENT CHEMICALS AND FIRE FIGHTING FOAMS). THE PRESENT FACILITY OCCUPIES APPROXIMATELY 1,500 ACRES AND EMPLOYS ABOUT 1,200 WORKERS.

THE EPA REGION IV ENVIRONMENTAL SERVICES DIVISION OF ATHENS, GEORGIA (ESD) CONDUCTED AN INVESTIGATION IN AUGUST 1982 OF THE OLIN CHEMICAL COMPANY LOCATED ADJACENT TO THE CIBA-GEIGY SITE. AS A PART OF THE INVESTIGATION, ESD SAMPLED A DRINKING WATER WELL ON CIBA-GEIGY PROPERTY. THIS SAMPLING INDICATED THE PRESENCE OF HAZARDOUS SUBSTANCES WHICH WARRANTED FURTHER EVALUATION OF THE CONTAMINATION PROBLEM AT CIBA-GEIGY. IN JUNE 1983, THE HAZARDOUS RANKING SYSTEM (HRS) SURVEY WAS COMPLETED AND THE SITE WAS ASSIGNED A RANKING OF 53.42. THE CIBA-GEIGY MCINTOSH PLANT WAS INCLUDED ON THE NATIONAL PRIORITIES LIST (NPL) IN SEPTEMBER 1983.

IN OCTOBER 1985, EPA ISSUED CIBA-GEIGY A RCRA PERMIT, WHICH INCLUDED A CORRECTIVE ACTION PLAN REQUIRING CIBA-GEIGY TO REMOVE AND TREAT CONTAMINATED GROUNDWATER AND SURFACE WATER AT THE SITE. THE CORRECTIVE ACTION PLAN STIPULATED THAT CIBA-GEIGY WOULD PREPARE A REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) FOR THE DISPOSAL AREAS BEING STUDIED BY THE SUPERFUND PROGRAM. FIGURE 2 DEPICTS THE LOCATION OF CERCLA AREAS WITHIN THE CIBA-GEIGY SITE.

THE TEN UNITS CLOSED UNDER THE RCRA PERMIT INCLUDE:

DIAZINON WASTEWATER SEWER: UTILIZED TO PIPE DIAZINON WASTE TO THE DIAZINON DESTRUCT IMPOUNDMENT. CLOSURE UNDER POST CLOSURE CARE IN 1976.

TRIANGULAR IMPOUNDMENT: CONSTRUCTED IN THE 1970S TO DECOMPOSE DIAZINON RESIDUES. CLOSURE DURING INTERIM STATUS COMPLETED IN 1986.

RECTANGULAR IMPOUNDMENT: CONSTRUCTED IN 1972-1973 TO HOLD SLUDGE FROM THE DILUTE IMPOUNDMENT. CLOSURE DURING INTERIM STATUS COMPLETED IN 1987.

CLASS C LANDFILL: PERMITTED BY ALABAMA IN 1973 AND PERMITTED UNDER RCRA INTERIM STATUS REGULATIONS. CLOSURE DURING INTERIM STATUS COMPLETED IN 1987.

BIOLOGICAL SLUDGE LANDFILL: PERMITTED BY ALABAMA IN 1978 AND LATER OPERATED UNDER RCRA INTERIM STATUS FOR DISPOSAL OF DEWATERED SLUDGE. CLOSURE DURING INTERIM STATUS COMPLETED IN 1987.

DIAZINON DESTRUCT IMPOUNDMENT: CONSTRUCTED IN 1965. CLOSURE UNDER POST CLOSURE CARE COMPLETED IN 1989.

GM-44 IMPOUNDMENT: PUT INTO SERVICE IN EARLY 1970S. CONSTRUCTED FOR THE GM-44 WASTES HIGH IN NITROGEN COMPOUNDS. ITS USE WAS DISCONTINUED IN THE LATE 1970S. CLOSURE UNDER POST CLOSURE CARE COMPLETED IN 1989.

EFFLUENT DIFFUSER LINE: CONSTRUCTED IN LATE 1968 TO CONVEY EFFLUENT FOR DISCHARGE INTO THE TOMBIGBEE RIVER. TAKEN OUT OF SERVICE IN 1973 DUE TO A CHANGE IN THE WASTEWATER TREATMENT SYSTEM, CLOSURE OF RCRA IMPOUNDMENTS, AND A CHANGE IN THE NPDES PERMIT.

EFFLUENT DISPOSAL WELL: INSTALLED IN 1971. USED FOR THE INJECTION OF BIOTREATED EFFLUENT TO REDUCE THE QUANTITY OF NACL DISCHARGED INTO THE RIVER. THE USE OF THE WELL WAS UNSUCCESSFUL AND IT WAS PLUGGED IN 1983. ADEM REQUIRED NO POST-CLOSURE MONITORING.

DILUTE DITCH: THIS DITCH COLLECTED DILUTE WASTEWATER AND SURFACE WATER RUNOFF TO BE CONVEYED TO THE DILUTE IMPOUNDMENT. USE CEASED IN 1971.

PURSUANT TO THE CORRECTIVE ACTION PORTION OF THE PERMIT, IN 1987, CIBA-GEIGY INSTALLED A GROUNDWATER PUMPING SYSTEM TO INTERCEPT AND REMOVE CONTAMINATED GROUNDWATER FROM THE SHALLOW ALLUVIAL AQUIFER. THE WATER REMOVED FROM THESE WELLS WAS TREATED IN THE PLANT'S EXISTING ON-SITE WASTEWATER TREATMENT SYSTEM UNTIL FALL 1988, WHEN THE PLANT'S NEW BIOLOGICAL WASTEWATER TREATMENT SYSTEM WAS COMPLETED AND USED TO TREAT THE GROUNDWATER. THE TREATED WATER IS DISCHARGED INTO THE TOMBIGBEE RIVER IN COMPLIANCE WITH APPROPRIATE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) REGULATIONS. CIBA-GEIGY HAS INSTALLED FOUR (4) CORRECTIVE ACTION MONITORING WELLS ALONG THE SOUTHERN BOUNDARY OF THE PROPERTY TO MONITOR THE EFFECTIVENESS OF THE PUMPING WELL SYSTEM. THE EFFECTIVENESS OF THE PUMP AND TREAT SYSTEM IN PREVENTING THE MIGRATION OF CONTAMINATED GROUNDWATER OFF-SITE AND REDUCING THE CONCENTRATIONS OF CONTAMINANTS IN THE GROUNDWATER IS WELL ESTABLISHED.

EPA COMPLETED THE SUPERFUND DECISION DOCUMENT (THE RECORD OF DECISION OR ROD) FOR OPERABLE UNIT ONE IN SEPTEMBER 1989 AFTER PUBLIC COMMENTS WERE CAREFULLY CONSIDERED. THE ROD IDENTIFIED THE EPA SELECTED REMEDY, "NO FURTHER ACTION". THIS SELECTION WAS BASED ON AND CONCURRED WITH THE GROUNDWATER PUMP AND TREAT SYSTEM INSTALLED UNDER THE RCRA PERMIT TO ADDRESS GROUNDWATER CONTAMINATION IN THE SHALLOW AQUIFER AT THE SITE.

IN ACCORDANCE WITH THE CORRECTIVE ACTION PLAN, CIBA-GEIGY RETAINED BCM, A TECHNICAL CONSULTANT, TO PERFORM THE RI/FS. FIELD WORK, WHICH BEGAN IN OCTOBER 1985, WAS CONDUCTED BY BCM ON CIBA'S BEHALF, WITH EPA'S OVERSIGHT. THE PRINCIPAL FINDING OF THE RI STUDY WAS THE DEFINITION OF THE EXTENT OF CONTAMINATION FROM ELEVEN ADDITIONAL WASTE MANAGEMENT AREAS WITHIN THE STUDY AREA THAT WILL BE ADDRESSED UNDER CERCLA.

THE CERCLA SITE HAS BEEN GROUPED AND DIVIDED INTO TWO AREAS OF CONTAMINATION (AOC) BASED ON THEIR RELATIVE PROXIMITY TO EACH OTHER. THE AOCs ARE ROUGHLY SEPARATED BY THE RESERVOIR (SEE FIGURE 2).

EPA WILL CONTINUE ITS CERCLA ENFORCEMENT ACTIVITIES AND WILL SEND A SPECIAL NOTICE LETTER TO CIBA-GEIGY PRIOR TO THE INITIATION OF THE REMEDIAL DESIGN FOR THE SELECTED REMEDIAL ACTION. SHOULD CIBA-GEIGY DECLINE TO CONDUCT FUTURE REMEDIAL ACTIVITIES, EPA WILL EITHER TAKE ADDITIONAL CERCLA ENFORCEMENT ACTIONS OR PROVIDE FUNDING FOR THESE ACTIVITIES WHILE SEEKING COST RECOVERY FOR ALL EPA-FUNDED RESPONSE ACTIONS AT THIS SITE.

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2.0 HIGHLIGHTS OF COMMUNITY RELATIONS

THE RI FOR THE CIBA-GEIGY SITE WAS RELEASED TO THE PUBLIC IN AUGUST 1988. THE FS AND THE PROPOSED PLAN FOR THE CIBA-GEIGY SITE WERE RELEASED TO THE PUBLIC ON JULY 30, 1990. THESE DOCUMENTS WERE MADE AVAILABLE BY PLACEMENT IN BOTH THE ADMINISTRATIVE RECORD DOCKET AND THE INFORMATION REPOSITORY MAINTAINED AT THE EPA DOCKET ROOM AT REGION IV HEADQUARTERS IN ATLANTA, GEORGIA AND AT THE MCINTOSH TOWN HALL, IN MCINTOSH, ALABAMA. PURSUANT TO REGULATIONS, A PUBLIC COMMENT PERIOD WAS HELD FROM JULY 30, 1990 THROUGH AUGUST 30, 1990. A NOTICE WAS PUBLISHED IN THE MOBILE PRESS REGISTER ON JULY 31, 1990 ANNOUNCING THE COMMENT PERIOD. IN ADDITION TO THE PUBLIC COMMENT PERIOD AND THE ADMINISTRATIVE RECORD FILES, A PUBLIC MEETING WAS HELD ON AUGUST 16, 1990 IN MCINTOSH ALABAMA. AT THIS MEETING, REPRESENTATIVES FROM EPA, AND ADEM ANSWERED QUESTIONS AND ADDRESSED COMMUNITY CONCERNS.

AFTER REVIEW OF COMMENTS RECEIVED DURING THE COMMENT PERIOD, EPA ISSUED AN AMENDED PROPOSED PLAN TO CLARIFY THE ALTERNATIVES CONSIDERED FOR THE CLEANUP OF CONTAMINATION FOUND AT THE CIBA-GEIGY SITE. A NOTICE WAS PUBLISHED IN THE MOBILE PRESS REGISTER ON FEBRUARY 7, 1991 ANNOUNCING THE COMMENT PERIOD. THE COMMENT PERIOD FOR THE AMENDED PROPOSED PLAN BEGAN FEBRUARY 4, 1991 AND ENDED MARCH 6, 1991, WITH A PUBLIC MEETING SCHEDULED FOR FEBRUARY 20, 1991 IF A WRITTEN REQUEST WAS RECEIVED BY EPA NO LATER THAN FEBRUARY 13, 1991. A REQUEST TO EXTEND THE COMMENT PERIOD WAS RECEIVED AND GRANTED, HOWEVER NO REQUESTS WERE RECEIVED TO CONDUCT A PUBLIC MEETING. THE EXTENDED PUBLIC COMMENT PERIOD ENDED APRIL 5, 1991.

BASED ON THE WRITTEN COMMENTS RECEIVED DURING THE COMMENT PERIOD FOR THE AMENDED PROPOSED PLAN, EPA ISSUED THE MODIFICATION TO THE AMENDED PROPOSED PLAN IN JULY 1991. A NOTICE WAS PUBLISHED IN THE MOBILE PRESS REGISTER ON JULY 15, 1991 ANNOUNCING THE PUBLIC COMMENT PERIOD WHICH ENDED AUGUST 18, 1991. EPA PROVIDED THE OPPORTUNITY FOR AN ADDITIONAL PUBLIC MEETING ON AUGUST 6, 1991 UPON WRITTEN REQUEST TO THE AGENCY. NO REQUEST FOR A PUBLIC MEETING WAS RECEIVED.

A RESPONSE TO ALL SIGNIFICANT COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIODS IS INCLUDED IN THE RESPONSIVENESS SUMMARY WHICH IS A PART OF THIS RECORD OF DECISION.

THIS DECISION DOCUMENT PRESENTS THE SELECTED REMEDIAL ACTION FOR OPERABLE UNIT TWO OF THE CIBA-GEIGY SITE, CHOSEN IN ACCORDANCE WITH CERCLA, AS AMENDED BY SARA AND TO THE EXTENT PRACTICABLE, THE NCP. THE DECISION FOR THIS SITE IS BASED ON THE ADMINISTRATIVE RECORD. THE REQUIREMENTS UNDER SECTION 117 OF CERCLA/SARA FOR PUBLIC AND STATE PARTICIPATION HAVE BEEN MET FOR THIS OPERABLE UNIT.

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3.0 SCOPE AND ROLE OF OPERABLE UNIT

DUE TO THE SIZE OF THE FACILITY, THE NUMBER OF AREAS AND THE VARIETY OF CONTAMINANTS, THE PROBLEMS AT THE CIBA-GEIGY SITE ARE COMPLEX. AS A RESULT EPA INITIALLY ORGANIZED THE WORK INTO THREE (3) OPERABLE UNITS (OUS). THE OPERABLE UNITS AT THIS SITE AS IDENTIFIED IN THE INITIAL ROD ISSUED FOR OPERABLE UNIT ONE IN SEPTEMBER 1989 ARE:

- OU #1 CONTAMINATION OF THE SHALLOW (ALLUVIAL) GROUNDWATER AQUIFER.
- OU #2 CONTAMINATION OF THE DEEP (MIOCENE) GROUNDWATER AQUIFER, IF
 CONTAMINATION WAS FOUND DURING ADDITIONAL SAMPLING.
- OU #3 CONTAMINATION OF SOILS AT ELEVEN (11) FORMER WASTE MANAGEMENT
 AREAS TO BE ADDRESSED UNDER CERCLA AUTHORITY.

IN JUNE 1989, ADDITIONAL SAMPLING OF THE DEEP (MIOCENE) GROUNDWATER AQUIFER WAS CONDUCTED BY CIBA-GEIGY AND A GROUNDWATER REVIEW & UPDATE REPORT WAS PRESENTED TO ADEM AND EPA. THE RESULTS FROM THE SAMPLING SHOWED NO CONTAMINATION PRESENT IN THE DEEP AQUIFER. IF FURTHER SAMPLING DATA SHOWS THE PRESENCE OF CONTAMINATION, THE MIOCENE AQUIFER WILL BE RE-EVALUATED. HOWEVER, AS A RESULT OF THE PRESENT FINDINGS, OPERABLE UNIT #2, AS IDENTIFIED ABOVE, WILL NOW ADDRESS CONTAMINATED SOILS IN TEN OF ELEVEN FORMER WASTE MANAGEMENT AREAS. TWO ADDITIONAL OPERABLE UNITS ARE CURRENTLY PLANNED TO ADDRESS OTHER CONTAMINATION AT THE SITE.

THE OPERABLE UNITS HAVE BEEN REDEFINED AS FOLLOWS:

- OU #1 CONTAMINATION OF THE SHALLOW (ALLUVIAL) GROUNDWATER AQUIFER.
- OU #2 CONTAMINATION OF SOILS AT TEN OF ELEVEN FORMER WASTE MANAGEMENT AREAS.
- OU #3 CONTAMINATION WITHIN THE FLOODPLAIN, THE LOWER PORTION OF THE
 DILUTE DITCH AND AREAS IN THE TOMBIGBEE RIVER WITHIN CLOSE
 PROXIMITY TO THE SITE.
- OU #4 CONTAMINATION OF SOILS IN FORMER WASTE MANAGEMENT AREA 8 AND
 THE UPLAND PORTION OF THE DILUTE DITCH.

OPERABLE UNIT #2 ADDRESSES THE CONTAMINATION OF SOILS AT SELECTED FORMER WASTE MANAGEMENT AREAS. THE JANUARY 1990 DRAFT FEASIBILITY STUDY SUBMITTED BY CIBA-GEIGY DOCUMENTS THE DEVELOPMENT, SCREENING AND DETAILED EVALUATION OF POTENTIAL ALTERNATIVES FOR REMEDIATION OF ELEVEN FORMER WASTE MANAGEMENT AREAS IDENTIFIED AND CHARACTERIZED DURING THE REMEDIAL INVESTIGATION. EPA HAS EVALUATED THE ALTERNATIVES AND THE RISK POSED BY THE CONTAMINANTS AS THEY RELATE TO THE "CERCLA" SITE. BASED ON THIS EVALUATION, EPA HAS DETERMINED THE ALTERNATIVE OR COMBINATION OF ALTERNATIVES WHICH WILL ACHIEVE THE CERCLA CLEANUP OBJECTIVE, TO REMEDIATE THE SOURCE OF CONTAMINATION

AND PREVENT CURRENT OR FUTURE EXPOSURE TO CONTAMINATED GROUNDWATER AT TEN OF ELEVEN FORMER WASTE MANAGEMENT AREAS. THIS OPERABLE UNIT IS CONSISTENT WITH PAST WORK CONDUCTED AT THE SITE AND FUTURE WORK TO BE CONDUCTED.

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4.0 SUMMARY OF SITE CHARACTERISTICS

4.1 GEOLOGY/SOILS

THE CIBA-GEIGY PROPERTY IS LOCATED WITHIN THE SOUTHERN PINE HILLS, WHICH ARE ELEVATED FEATURES THAT REGIONALLY SLOPE SOUTHWARD TOWARD THE GULF OF MEXICO. THESE HILLS ARE DISSECTED BY VARIOUS RIVER SYSTEMS THAT FEED INTO THE GULF. THE PLANT IS LOCATED UPON A LOW TERRACE ADJACENT TO THE FLOODPLAIN OF THE TOMBIGBEE RIVER. THE PROPERTY LIES WITHIN THE BOUNDARIES OF THE MOBILE GRABEN, A DOWNTOWN FAULT BLOCK PARALLELING THE RIVER.

THE SURFICIAL AND SHALLOW GEOLOGY CAN BE BROKEN INTO THREE DISTINCT FEATURES. THE UPPERMOST LAYER IS A RELATIVELY CONTINUOUS CLAY LAYER CONTAINING SAND AND SILTY SAND LENSES AND CLAY LAYERS THAT RANGE FROM ONLY A FEW FEET TO OVER 50 FEET IN THICKNESS. UNDERLYING THE CLAY LAYER ARE PLEISTOCENE-AGE ALLUVIUM AND LOW TERRACE DEPOSITS OF INTERBEDDED GRAVEL, SILT, AND CLAY WITH THICKNESSES RANGING FROM 60 TO 100 FEET. THESE DEPOSITS OUTCROP THROUGHOUT THE AREA.

UNDERLYING THE LOW TERRACE DEPOSITS ARE ALTERNATING LAYERS OF MIOCENE-AGE GRAVELS, SANDS, AND CLAYS. REGIONALLY, UPPER MIOCENE CLAY HYDRAULICALLY SEPARATES THE MIOCENE AND PLEISTOCENE DEPOSITS (SEE FIGURE 3).

EROSION AND REDEPOSITION OF THESE SEDIMENTS REFLECT DYNAMIC DEPOSITIONAL ENVIRONMENTS WHICH ARE COMMON ON A REGIONAL SCALE. THIS HAS RESULTED IN A COMPLEX SUBSURFACE STRATIGRAPHY. VARIATIONS OF PHYSICAL CHARACTERISTICS (E.G. POROSITY, GRAIN SIZE, HYDRAULIC CONDUCTIVITY) BOTH VERTICALLY AND Laterally WITHIN THE STRATA COMPLICATE THE MOVEMENT OF WATER IN THE SUBSURFACE. NINE DIFFERENT SOIL SERIES ARE LOCATED WITHIN THE AREA OF THE PLANT. THESE SOILS ARE GENERALLY LOAMY CLAYS AND SANDS THAT RANGE FROM WELL DRAINED TO POORLY DRAINED. PERMEABILITY OF THE SOIL RANGES FROM MODERATE TO LOW.

4.2 HYDROGEOLOGY

BOTH THE PLEISTOCENE AND MIOCENE STRATA ARE WATER BEARING AND REPRESENT TWO DISTINCT AQUIFERS, THE ALLUVIAL AND UPPER MIOCENE. THEY ARE SEPARATED BY A NUMBER OF SHALE AND CLAY AQUITARDS AND AQUICLIDES.

THE ALLUVIAL AQUIFER IS COMPOSED OF THE RECENT AND PLEISTOCENE TERRACE AND ALLUVIAL DEPOSITS. THE THICKNESS OF THE AQUIFER AND THE WATER LEVEL DEPEND ON THE THICKNESS AND CONFIGURATION OF THE OVERLYING CLAY LAYER. UNDER NATURAL, SEMI-CONFINED CONDITIONS, THE SATURATED THICKNESS OF THE ALLUVIAL AQUIFER RANGES FROM LESS THAN 30 FEET TO OVER 50 FEET. RECHARGE OF THE ALLUVIAL AQUIFER COMES LOCALLY, FROM RAINFALL, STREAMS, AND RESERVOIRS. HIGH FLOODS IN THE RIVER FLOODPLAIN ALSO RECHARGE THE AQUIFER.

THE GROUNDWATER FLOW OF THE ALLUVIAL AQUIFER NORMALLY SLOPES GENTLY TO THE SOUTH-SOUTHEAST TOWARD THE TOMBIGBEE RIVER. HOWEVER, THE FLOW OF GROUNDWATER IS MODIFIED BY THE PUMPING AND CAPTURE OF CONTAMINATED GROUNDWATER BY THE PLANT AND RECHARGE FROM THE SITE RESERVOIR. THIS SYSTEM WAS DESIGNED TO REDUCE THE LEVEL OF CONTAMINANTS IN THE GROUNDWATER BELOW THE FACILITY AND PREVENT FURTHER MIGRATION OF THE CONTAMINATED GROUNDWATER. THE CONCENTRATIONS OF CONTAMINANTS PRESENT IN THE GROUNDWATER HAS DECREASED AND THE OPERATION OF THE INTERCEPT WELLS HAS REVERSED THE DIRECTION OF GROUNDWATER FLOW AS A RESULT OF THE PUMPING.

THE UPPER MIOCENE UNDERLYING THE PLANT IS A CONFINED AQUIFER OF SANDS AND GRAVELS CAPPED BY A CLAY LAYER ABOUT 100 TO 130 FEET IN THICKNESS. RECHARGE OF THIS AQUIFER IS BELIEVED TO COME FROM REGIONAL INFILTRATION IN OUTCROP AREAS THAT UP-DIP TO THE NORTH. IN CONTRAST TO THE ALLUVIAL AQUIFER, THE QUALITY OF UPPER MIOCENE WATER CAN BE EFFECTED BY REGIONAL INFLUENCES SUCH AS SALT DOMES OR SALTWATER INTRUSION FROM THE GULF OF MEXICO.

PALEO-CHANNELING HAS BEEN FOUND TO EXIST IN THE SURFACE OF THE MIOCENE CLAY. HOWEVER, DURING THE INVESTIGATION FOR THE GROUNDWATER CORRECTIVE ACTION PROGRAM, AND AS A PART OF THE RI/FS, IT WAS DETERMINED THAT THE TWO AQUIFERS ARE NOT HYDRAULICALLY CONNECTED.

4.3 SURFACE WATER

THE CIBA-GEIGY FACILITY PROPERTY LIES WITHIN THE TOMBIGBEE RIVER BASIN WHICH HAS A DRAINAGE AREA OF 8,378 SQUARE MILES. THE TOMBIGBEE RIVER FLOWS PAST THE SITE, CONVERGING FURTHER SOUTH WITH THE ALABAMA RIVER TO FORM THE MOBILE RIVER.

SURFACE WATER FEATURES AT THE CIBA-GEIGY PLANT INCLUDE THE DIVERTED JOHNSON CREEK ON THE NORTHERN EDGE OF THE PROPERTY, AND A LARGE, MAN-MADE RESERVOIR BETWEEN THE MANUFACTURING AREA AND THE WASTE MANAGEMENT FACILITIES. SURFACE WATER RUNOFF ON THE NORTHERN, UNDEVELOPED CORNER OF THE PROPERTY DRAINS OFF-SITE THROUGH DITCHES INTO THE TOMBIGBEE RIVER. THE SURFACE WATER SYSTEM SOUTH OF JOHNSON CREEK HAS UNDERGONE EXTENSIVE CHANGE. IN ADDITION TO A NEW WASTEWATER TREATMENT SYSTEM, A NEW STORMWATER MANAGEMENT SYSTEM HAS BEEN CONSTRUCTED TO REPLACE THE OLD COMBINED DILUTE WASTEWATER/STORMWATER SYSTEM, WHICH USED STORMWATER SEWERS, OPEN SURFACE DITCHES, AND THE DILUTE DITCH TO CONVEY MIXED DILUTE WASTEWATER AND STORMWATER TO THE DILUTE IMPOUNDMENT. THE NEW SYSTEM SEGREGATES ALL WASTEWATER, DILUTE AND PROCESS, TO THE WASTEWATER COLLECTION AND TRANSFER SYSTEM AND THEN ON TO THE BIOLOGICAL WASTEWATER TREATMENT SYSTEM. ALL STORMWATER SEWERS HAVE BEEN RENOVATED AND ALL OPEN DITCHES HAVE BEEN REPLACED WITH STORMWATER SEWERS DRAINING TO STORMWATER RETENTION TANKS CAPABLE OF HOLDING A ONE-INCH RAINFALL OVER THE ENTIRE DEVELOPED MANUFACTURING AREA OF THE PLANT. ALL INITIAL RAINWATER RETAINED IS TRANSFERRED TO THE BIOLOGICAL WASTEWATER TREATMENT PLANT. ALL STORMWATER OVERFLOW (RAINFALL ABOVE ONE INCH) IS DIVERTED TO ESTABLISHED DRAINAGEWAYS DISCHARGING TO THE TOMBIGBEE RIVER.

4.4 SAMPLE RESULTS FROM FORMER WASTE MANAGEMENT AREAS

THE PRIMARY EMPHASIS FOR ANALYTICAL TESTING DURING THE RI WAS TO DETERMINE THE NATURE AND EXTENT OF THE SOIL CONTAMINATION AT THE SITE. AS A RESULT, SOIL AND WASTE SAMPLES WERE COLLECTED AND ANALYZED TO DETERMINE THE CHEMICAL CONTAMINATION PRESENT AT THE SITE. THE FOLLOWING IS A BRIEF DESCRIPTION AND A VOLUME ESTIMATE OF EACH OF THE TEN (10) WASTE MANAGEMENT AREAS TO BE ADDRESSED IN OPERABLE UNIT TWO, UNDER CERCLA AUTHORITY.

TABLE 4-1 SUMMARIZES THE MAXIMUM, MINIMUM AND MEDIAN CONCENTRATION AND DETECTION FREQUENCY FOR THE CONTAMINANTS FOUND IN THE SOIL THROUGHOUT THE SITE. DURING THE DEVELOPMENT OF THIS ROD IT WAS DETERMINED, BASED ON TOXICITY, MOBILITY, AND FREQUENCY OF DETECTION, THAT IF CERTAIN CONTAMINANTS WERE EXCAVATED AND REMEDIATED TO ACCEPTABLE LEVELS, THE REMAINING CONTAMINANTS WOULD ALSO BE EXCAVATED AND REMEDIATED TO ACCEPTABLE LEVELS. THE SELECTED CONTAMINANTS OF CONCERN ARE PRESENTED IN TABLE 4-2 (ALSO SEE SECTION 5.1).

AREA 1 (ORIGINAL EFFLUENT IMPOUNDMENT)

AREA 1 IS A FORMER WASTEWATER IMPOUNDMENT CURRENTLY FILLED IN WITH MATERIAL FROM SANDBLASTING ACTIVITIES. THE WASTE AT AREA 1 IS SLUDGE CONTAINING PESTICIDE RESIDUES, BY-PRODUCTS, AND INTERMEDIATES FROM PESTICIDE MANUFACTURING. SOME OF THE WASTE IN AREA 1 EXTENDS INTO UNCONSOLIDATED SOILS WITHIN A SATURATED ZONE. THE ESTIMATED VOLUME OF CONTAMINATION IN AREA 1 IS 12,500 CUBIC YARDS.

AREA 2 (WASTE DISPOSAL PIT)

AREA 2 IS A SMALL, FORMER DISPOSAL PIT COVERED BY FILL LOCATED IMMEDIATELY EAST OF AREA 1. THE PIT CONTAINS WASTE CONSISTING OF TRASH, PESTICIDE RESIDUES, BY-PRODUCTS, AND INTERMEDIATES FROM PESTICIDE MANUFACTURING. THE ESTIMATED VOLUME OF CONTAMINATION IN AREA 2 IS 2,100 CUBIC YARDS.

AREA 3 (TAR DISPOSAL AREA)

AREA 3 IS AN AREA CONSISTING OF FIVE DISCRETE PAST WASTE MANAGEMENT AREAS EVIDENCING BROAD

SURFICIAL CONTAMINATION. BASED ON THE FIELD WORK CONDUCTED DURING THE RI/FS, AREA 3 HAS BEEN DIVIDED INTO 5 SPECIFIC AREAS AND A GENERAL AREA OF CONTAMINATION BASED ON DIFFERENCES IN COLORS OF THE WASTE. THE AREA NOW INCLUDES AREAS 3A, 3B, 3C, 3D, 3E AND 3 GENERAL.

AREA 3A'S WASTE CONSISTS OF A WHITE AND PINK CHEMICAL SOLID. SOME OF THE MATERIAL IS LOCATED WITH DETERIORATED STEEL DRUMS. AREA 3B'S WASTE IS A VISCOUS CLEAR TO AMBER LIQUID AND A GREYISH-BLUE SOLID. DRUMS WERE ENCOUNTERED AT FOUR FEET. AREA 3C'S WASTE CONSISTS OF WHITE SOLIDS. DETERIORATED DRUMS WERE ENCOUNTERED TWO FEET BELOW THE SURFACE. AREA 3D'S WASTE CONSISTS OF SEVEN FEET OF CLAYEY SILT FILL CONTAINING BURNT WOOD, SHELL AND ORGANIC DEBRIS. A FIVE FOOT LAYER OF BLACK TAR-LIKE SOLID WASTE WAS ENCOUNTERED BENEATH THE FILL. AREA 3E'S WASTE CONSISTS OF AN APPROXIMATELY TEN FOOT THICK LAYER OF CLAYEY SILT FILL MATERIAL CONTAINING SHELL, CONCRETE, BURNT WOOD, CHARCOAL AND CHEMICAL WASTE WHICH OVERLIES UNDISTURBED SOIL. AREA 3 GENERAL INCLUDES AN AREA WITH A THIN TAR LAYER AND CONTAMINATED SOIL, THE STOCKPILE AREA, AND A FORMER COOLING WATER DITCH WITH ASSOCIATED CONTAMINATED SOIL. THE STOCKPILE AREA CONTAINS INTERMIXED SOIL AND WASTE EXCAVATED DURING CONSTRUCTION OF THE NEW COOLING WATER DISCHARGE PIPELINE. CONTAMINATED SEDIMENTS IN THE EASTERN SEGMENT OF THE FORMER COOLING WATER DITCH WERE ALSO TRANSFERRED TO THE STOCKPILE AREA DURING CONSTRUCTION OF THE NEW COOLING WATER DISCHARGE PIPELINE.

THE ESTIMATED VOLUME OF CONTAMINATION IN AREA 3 IS 51,100 CUBIC YARDS.

AREA 4 (WASTE DISPOSAL PITS)

AREA 4 CONSISTS OF THREE ISOLATED, SHALLOW DISPOSAL PITS; AREAS 4A, 4B, AND 4C, WHICH ARE COVERED BY CLAY FILL. THE PITS CONTAIN PESTICIDE RESIDUES AND INTERMEDIATES FROM PESTICIDE MANUFACTURING. AREA 4A'S WASTE CONSISTS OF TWO FEET OF DARK GREY SOLID BELOW SIX FEET OF FILL. AREA 4B AND 4C'S WASTES WERE DETERMINED TO BE IDENTICAL AND CONSIST OF TWO FEET OF BLACK SOLID WASTE WITH GREEN AND YELLOW STREAKING COVERED BY SIX FEET OF FILL. THE ESTIMATED VOLUME OF CONTAMINATION IN AREA 4 IS 2,500 CUBIC YARDS.

AREA 5 (OPEN BURN AREA)

AREA 5 IS AN AREA WHERE OPEN BURNING WAS FORMERLY PRACTICED. THE AREA IS COVERED BY CLAY FILL AND CONTAINS TRASH, BURNED DEMOLITION DEBRIS, PESTICIDE RESIDUES, BY-PRODUCTS, AND INTERMEDIATES FROM PESTICIDE MANUFACTURING. THE ESTIMATED VOLUME OF CONTAMINATION IN AREA 5 IS 8,200 CUBIC YARDS.

AREA 6 (TEMPORARY TRASH STAGING AREA)

AREA 6 IS THE LOCATION OF TWO ADJACENT FORMER TRASH STAGING AREAS COVERED BY CLAY FILL. THE SITE CONTAINS TRASH CONSISTING OF COMBUSTIBLE REFUSE SUCH AS PLASTIC, PAPER, CARDBOARD, AND RUBBER INTERMIXED WITH MANUFACTURED PESTICIDES AND METALS. THE ESTIMATED VOLUME OF CONTAMINATION IN AREA 6 IS 10,400 CUBIC YARDS.

AREA 7 (DISPOSAL SITE SOUTH OF THE CLASS C LANDFILL)

AREA 7 IS A FORMER DISPOSAL PIT COVERED WITH CLAY FILL. THE AREA CONTAINS DRUMS, SOLID WASTE, JARS, BULK SOLID WASTES, AND TRASH. THE WASTE IS COMPRISED OF PESTICIDE RESIDUES, BY-PRODUCTS, AND INTERMEDIATES FROM PESTICIDE MANUFACTURING. THE ESTIMATED VOLUME OF CONTAMINATION IN AREA 7 IS 7,400 CUBIC YARDS.

AREA 8 (BLUFFLINE AREA)

AREA 8 WILL BE ADDRESSED IN OPERABLE UNIT #4.

AREA 9 (BHC BURIAL AREA)

AREA 9 IS A CHEMICAL MATERIAL BURIAL AREA COVERED WITH CLAY FILL. THE AREA CONTAINS BULK PESTICIDE BY-PRODUCTS, PREDOMINANTLY ISOMERS OF BHC, AND RESIDUES. THE ESTIMATED VOLUME OF CONTAMINATION IN AREA 9 IS 32,100 CUBIC YARDS.

AREA 10 (WAREHOUSE NO. 218)

AREA 10 CONSISTS OF A THIN LAYER OF WASTE PARTIALLY COVERED BY AN EXISTING STORAGE WAREHOUSE. THE AREA CONTAINS SOLID WASTE CONSISTING OF PESTICIDE RESIDUES AND BY-PRODUCTS. THE WASTE IS OVERLAIN BY APPROXIMATELY EIGHT FEET OF COMPACTED CLAY FILL. THE GROUND SURFACE IS PRIMARILY COVERED WITH REINFORCED CONCRETE.

AREA 11 (TRASH STAGING AREA)

AREA 11 CONSISTS OF INTERMIXED SOIL AND WASTE UNDERLYING THE CURRENT TRASH STAGING AREA. THE INTERMIXED SOIL AND WASTE CONSISTS OF PESTICIDE BY-PRODUCTS AND IS OVERLAIN BY APPROXIMATELY FOUR FEET OF COMPACTED CLAY FILL. THE SURFACE IS COVERED WITH REINFORCED CONCRETE EXCEPT FOR A SMALL PORTION ALONG THE SOUTHERN AND EASTERN EDGES, WHICH IS BARE GROUND. THE ESTIMATED VOLUME OF CONTAMINATION IN AREA 11 IS 1,000 CUBIC YARDS.

#SSR

5.0 SUMMARY OF SITE RISKS

CERCLA DIRECTS THE AGENCY TO CONDUCT A BASELINE RISK ASSESSMENT TO DETERMINE WHETHER A SUPERFUND SITE POSES A CURRENT OR POTENTIAL THREAT TO HUMAN HEALTH AND THE ENVIRONMENT IN THE ABSENCE OF ANY REMEDIAL ACTION. THE BASELINE RISK ASSESSMENT PROVIDES THE BASIS FOR DETERMINING WHETHER OR NOT REMEDIAL ACTION IS NECESSARY AND THE JUSTIFICATION FOR PERFORMING REMEDIAL ACTION.

5.1 CONTAMINANTS OF CONCERN

THE MAJORITY OF THE WASTES AND RESIDUES GENERATED BY PRODUCTION OPERATIONS AT THE FACILITY HAVE BEEN MANAGED, TREATED, AND DISPOSED OF ON-SITE THROUGHOUT THE SITE'S HISTORY. THE CONTAMINATED AREAS OF CONCERN ARE THE ELEVEN FORMER WASTE MANAGEMENT AREAS WHERE THESE WASTE AND RESIDUES WERE DISPOSED. TEN OF THESE AREAS WILL BE ADDRESSED IN OPERABLE UNIT TWO. THE CHEMICALS MEASURED IN THE VARIOUS ENVIRONMENTAL MEDIA IN THE REMEDIAL INVESTIGATION WERE EVALUATED FOR INCLUSION AS CHEMICALS OF POTENTIAL CONCERN IN THE RISK ASSESSMENT BY APPLICATION OF SCREENING CRITERIA. THE CRITERIA WHICH RESULTED IN ELIMINATION OF CHEMICALS INCLUDED: SITE CONTAMINANT CONCENTRATIONS BELOW BACKGROUND CONCENTRATIONS; MEASUREMENTS BELOW QUANTITATION LIMITS; A COMBINATION OF LOW TOXICITY AND LOW CONCENTRATION OR LOW PERSISTENCE AND LOW CONCENTRATION AND LOW FREQUENCY OF DETECTION.

SEPARATE LISTS OF CHEMICALS OF POTENTIAL CONCERN WERE IDENTIFIED FOR EACH OF THE PAST WASTE MANAGEMENT AREAS. TYPICALLY, THE CHEMICALS OF CONCERN FOR EACH SITE AREA INCLUDE HIGH MOLECULAR WEIGHT CHLORINATED PESTICIDES (E.G., DDT, GAMMA-BHC), SITE-MANUFACTURED PESTICIDES (E.G., ATRAZINE, SIMAZINE), AND VOLATILE SOLVENTS (E.G., CHLOROFORM, XYLENES). THE MEDIA OF CONCERN FOR THIS OPERABLE UNIT IS CONTAMINATED SOIL. THE MAXIMUM AND MINIMUM CONCENTRATIONS OF ANALYTES FOUND IN THE SUBSURFACE SOIL AREA-WIDE AT THE CIBA-GEIGY SITE ARE CONTAINED IN TABLE 4-1. SINCE AREA 2, THE EASTERN PORTION OF AREA 3 AND AREA 9 MAY HAVE SURFICIAL CONTAMINATION, THEY WERE EVALUATED FOR THE DIRECT CONTACT EXPOSURE ROUTE. THE EXPOSURE POINT CONCENTRATIONS, USED TO EVALUATE THE DIRECT CONTACT PATHWAY, FOR AREA 2, THE EASTERN PORTION OF AREA 3 AND AREA 9 ARE CONTAINED IN TABLE 5-1.

THE EXPOSURE CONCENTRATIONS REPRESENT A GEOMETRIC MEAN OF DATA COLLECTED FROM BOTH SURFACE AND

SUBSURFACE SAMPLES AND THEREFORE, THE DATA IN TABLE 5-1 DOES NOT NECESSARILY REFLECT LAND SURFACE CONCENTRATIONS.

5.2 EXPOSURE ASSESSMENT

WHETHER A CHEMICAL IS ACTUALLY A CONCERN TO HUMAN HEALTH AND THE ENVIRONMENT DEPENDS UPON THE LIKELIHOOD OF EXPOSURE, I.E. WHETHER THE EXPOSURE PATHWAY IS CURRENTLY COMPLETE OR COULD BE COMPLETE IN THE FUTURE. A COMPLETE EXPOSURE PATHWAY (A SEQUENCE OF EVENTS LEADING TO CONTACT WITH A CHEMICAL) IS DEFINED BY THE FOLLOWING FOUR ELEMENTS:

- A SOURCE AND MECHANISM OF RELEASE FROM THE SOURCE,
- A TRANSPORT MEDIUM (E.G., SURFACE WATER, AIR) AND MECHANISMS OF MIGRATION THROUGH THE MEDIUM,
- THE PRESENCE OR POTENTIAL PRESENCE OF A RECEPTOR AT THE EXPOSURE POINT, AND
- A ROUTE OF EXPOSURE (INGESTION, INHALATION, DERMAL ABSORPTION).

IF ALL FOUR ELEMENTS ARE PRESENT, THE PATHWAY IS CONSIDERED COMPLETE.

AN EVALUATION WAS UNDERTAKEN OF ALL POTENTIAL EXPOSURE PATHWAYS WHICH COULD CONNECT CHEMICAL SOURCES AT THE SITE WITH POTENTIAL RECEPTORS. ALL POSSIBLE PATHWAYS WERE FIRST HYPOTHEZIZED AND EVALUATED FOR COMPLETENESS USING EPA'S CRITERIA. THREE CURRENT POTENTIALLY COMPLETE EXPOSURE PATHWAYS AND TWO FUTURE EXPOSURE PATHWAYS REMAINED AFTER SCREENING. THE CURRENT PATHWAYS REPRESENT EXPOSURE PATHWAYS WHICH COULD EXIST UNDER CURRENT SITE CONDITIONS WHILE THE FUTURE PATHWAYS REPRESENT EXPOSURE PATHWAYS WHICH COULD EXIST, IN THE FUTURE, IF THE CURRENT EXPOSURE CONDITIONS CHANGE. EXPOSURE BY EACH OF THESE PATHWAYS WAS MATHEMATICALLY MODELED USING GENERALLY CONSERVATIVE ASSUMPTIONS.

THE CURRENT PATHWAYS ARE:

- INHALATION BY NEARBY RESIDENTS OF CONTAMINATED DUST PARTICLES FROM THE PAST WASTE MANAGEMENT AREAS WITH SUSPECTED SURFICIAL CHEMICALS (AREAS 2, EASTERN PORTION OF AREA 3 AND AREA 9);
- INHALATION BY NEARBY RESIDENTS OF VOLATILE CHEMICALS FROM SUBSURFACE SOURCES IN THE PAST WASTE MANAGEMENT AREAS; AND
- INGESTION OF VENISON BY LOCAL HUNTERS FROM DEER FEEDING IN VEGETATED AREAS OF THE FLOODPLAIN.

THE FUTURE PATHWAYS ARE:

- DIRECT CONTACT BY SITE WORKERS WITH SURFACE SOIL IN THE THREE AREAS WHICH MAY HAVE SURFICIAL CONTAMINATION (AREA 2, EASTERN PORTION OF AREA 3, AND AREA 9); AND
- INGESTION OF CONTAMINATED GROUNDWATER.

THE EXPOSURE POINT CONCENTRATIONS FOR EACH OF THE CHEMICALS OF CONCERN AND THE EXPOSURE ASSUMPTIONS FOR EACH PATHWAY WERE USED TO ESTIMATE THE CHRONIC DAILY INTAKES FOR THE POTENTIALLY COMPLETE PATHWAYS, WITH THE EXCEPTION OF THE GROUNDWATER PATHWAY. THE CHRONIC DAILY INTAKES WERE THEN USED IN CONJUNCTION WITH CANCER POTENCY FACTORS AND NONCARCINOGENIC REFERENCE DOSES TO EVALUATE RISK.

THE GROUNDWATER AT THE CIBA-GEIGY SITE CURRENTLY CONTAINS CONCENTRATIONS OF THE SITE

CONTAMINANTS AT LEVELS WHICH WOULD POSE AN UNACCEPTABLE RISK TO HUMAN HEALTH IF THE WATER WAS BEING USED FOR HUMAN CONSUMPTION. HOWEVER, THE SURFICIAL AQUIFER IS NO LONGER BEING USED AS A SOURCE OF POTABLE WATER AT THE CIBA-GEIGY PLANT. ALSO THE ONGOING GROUNDWATER EXTRACTION AND TREATMENT SYSTEM IS CAPTURING THE CONTAMINATED GROUNDWATER. AS A RESULT, THIS IS NOT A CURRENT COMPLETE EXPOSURE PATHWAY. THE FORMER WASTE MANAGEMENT AREAS ARE THE MAJOR CONTRIBUTORS TO THE CONTAMINATED GROUNDWATER.

THE FUTURE GROUNDWATER EXPOSURE PATHWAY WAS EVALUATED BY COMPARING SOIL CONCENTRATIONS WITH HEALTH-BASED SOIL CLEANUP LEVELS. THE HEALTH-BASED SOIL CLEANUP LEVELS WERE CALCULATED USING GROUNDWATER MODELS, TO ASSURE THAT DRINKING WATER MAXIMUM CONTAMINANT LEVELS (MCLS), AS ESTABLISHED UNDER THE SAFE DRINKING WATER ACT OR HEALTH-BASED LEVELS WOULD NOT BE EXCEEDED IN THE GROUNDWATER AS A RESULT OF CONTAMINANTS LEACHING THROUGH THE SOIL. AS WITH ALL MODELS, CERTAIN ASSUMPTIONS APPLY. AT THE CIBA-GEIGY SITE, SOME OF THE WASTES EXTEND TO OR NEAR THE GROUNDWATER SURFACE WHILE OTHER AREAS HAVE A SIGNIFICANT AMOUNT OF UNCONTAMINATED CLAY BENEATH THE WASTE. AS A RESULT, TWO MODELS HAVE BEEN APPLIED TO THE AREAS OF CONTAMINATION. THE EPA HEALTH-BASED SUBSURFACE SOIL CLEANUP LEVELS ARE BASED ON EITHER THE PESTAN OR SUMMERS MODELS, WHICH ARE USED TO ESTIMATE GROUNDWATER CONTAMINANT CONCENTRATIONS RESULTING FROM MIGRATION OF CONTAMINANTS THROUGH THE SOIL COLUMN. THE PESTAN AND SUMMERS MODELS INCORPORATE SITE-SPECIFIC AQUIFER CHARACTERISTICS AND CHEMICAL-SPECIFIC SOIL-WATER PARTITION COEFFICIENTS. THE PESTAN MODEL WAS USED IN AREAS WHERE AN UNCONTAMINATED ZONE EXISTS BETWEEN THE CONTAMINATED SOIL AND THE GROUNDWATER SURFACE (AREAS 2,3,5,6,7,10 AND 11). THE SUMMERS MODEL WAS USED IN AREAS WHERE CONTAMINATION HAS EXTENDED TO OR IS NEAR THE GROUNDWATER (AREAS 1,4 AND 9).

THE MAJOR ASSUMPTIONS ABOUT EXPOSURE FREQUENCY AND DURATION THAT WERE INCLUDED IN THE EXPOSURE ASSESSMENT WERE:

- FOR THE INGESTION OF VENISON SCENARIO, IT WAS ASSUMED THAT A LOCAL HUNTER KILLS ONE DEER PER YEAR AND THAT THE VENISON YIELD FROM THE DEER IS 44 KG. THIS QUANTITY OF VENISON WAS CONSERVATIVELY ASSUMED TO BE CONSUMED ANNUALLY THROUGHOUT A 70-YEAR LIFETIME.
- FOR THE INHALATION OF AMBIENT AIR SCENARIO IT WAS ASSUMED THAT AN INDIVIDUAL LIVES IN THE NEAREST RESIDENCE (2.5 KM FROM THE SITE) AND INHALES 20 M3 OF AIR PER DAY OVER A 70-YEAR LIFETIME. ALL PARTICULATE MATTER AT THE EXPOSURE POINT WAS ASSUMED TO BE RESPIRABLE AND DELIVERED TO THE PULMONARY REGION OF THE LUNG. THE CHEMICALS OF CONCERN WERE ASSUMED TO BE 100 PERCENT BIOAVAILABLE.
- FOR WORKERS THE DIRECT CONTACT WITH CONTAMINATED SOIL SCENARIO, IT WAS ASSUMED THAT A WORKER INGESTS 50 MG OF SOIL PER DAY SPENT AT THE SITE. ADDITIONALLY, IT WAS ASSUMED THAT THE INHALATION RATE WAS 20 M3/DAY. IT WAS ASSUMED THAT THE WORKER IS PRESENT AT THE SITE 250 DAYS A YEAR. THE ASSUMED EXPOSURE DURATION IS FOR 25 YEARS.
- IN ALL SCENARIOS A STANDARD BODY WEIGHT OF 70 KG WAS USED.

5.3 TOXICITY ASSESSMENT

TOXICITY VALUES ARE USED IN CONJUNCTION WITH THE RESULTS OF THE EXPOSURE ASSESSMENT TO CHARACTERIZE SITE RISK. EPA HAS DEVELOPED CRITICAL TOXICITY VALUES FOR CARCINOGENS AND NONCARCINOGENS. CANCER POTENCY FACTORS (CPFS) HAVE BEEN DEVELOPED BY EPA'S CARCINOGENIC ASSESSMENT GROUP FOR ESTIMATING EXCESS LIFETIME CANCER RISKS ASSOCIATED WITH EXPOSURE TO POTENTIALLY CARCINOGENIC CHEMICALS. CPFS, WHICH ARE EXPRESSED IN UNITS OF (MG/KG/DAY)⁻¹, ARE MULTIPLIED BY THE ESTIMATED INTAKE OF A POTENTIAL CARCINOGEN, IN MG/KG/DAY, TO PROVIDE AN UPPER-BOUND ESTIMATE OF THE EXCESS LIFETIME CANCER RISK ASSOCIATED WITH EXPOSURE AT THAT INTAKE LEVEL. THE TERM "UPPER BOUND" REFLECTS THE CONSERVATIVE ESTIMATE OF THE RISKS CALCULATED FROM THE CPF.

USE OF THIS CONSERVATIVE APPROACH MAKES UNDERESTIMATION OF THE ACTUAL CANCER RISK HIGHLY UNLIKELY. CANCER POTENCY FACTORS ARE DERIVED FROM THE RESULTS OF HUMAN EPIDEMIOLOGICAL STUDIES OR CHRONIC ANIMAL BIOASSAYS TO WHICH ANIMAL-TO-HUMAN EXTRAPOLATION AND UNCERTAINTY FACTORS HAVE BEEN APPLIED. THE CPFS FOR ORAL INGESTION AND INHALATION EXPOSURE TO THE CONTAMINANTS OF CONCERN AT THE SITE ARE CONTAINED IN TABLES 5-2, AND 5-3 RESPECTIVELY.

REFERENCE DOSES (RFDs) HAVE BEEN DEVELOPED BY EPA FOR INDICATING THE POTENTIAL FOR ADVERSE HEALTH EFFECTS FROM EXPOSURE TO CHEMICALS EXHIBITING NONCARCINOGENIC EFFECTS. RFDs, WHICH ARE EXPRESSED IN UNITS OF MG/KG/DAY, ARE ESTIMATES OF LIFETIME DAILY EXPOSURE LEVELS FOR HUMANS, INCLUDING SENSITIVE INDIVIDUALS. ESTIMATED INTAKES OF CHEMICALS FROM ENVIRONMENTAL MEDIA CAN BE COMPARED TO THE RFD. RFDs ARE DERIVED FROM HUMAN EPIDEMIOLOGICAL STUDIES OR ANIMAL STUDIES TO WHICH UNCERTAINTY FACTORS HAVE BEEN APPLIED (E.G., TO ACCOUNT FOR THE USE OF ANIMAL DATA TO PREDICT EFFECTS ON HUMANS). THESE UNCERTAINTY FACTORS HELP ENSURE THAT THE RFDs WILL NOT UNDERESTIMATE THE POTENTIAL FOR ADVERSE NONCARCINOGENIC EFFECTS TO OCCUR. THE RFDs FOR ORAL INGESTION AND INHALATION EXPOSURE TO THE CONTAMINANTS OF CONCERN AT THE SITE ARE CONTAINED IN TABLE 5-2, AND 5-3 RESPECTIVELY.

5.4 RISK CHARACTERIZATION

HUMAN HEALTH RISKS ARE CHARACTERIZED FOR POTENTIAL CARCINOGENIC AND NONCARCINOGENIC EFFECTS BY COMBINING EXPOSURE AND TOXICITY INFORMATION. EXCESSIVE LIFETIME CANCER RISKS ARE DETERMINED BY MULTIPLYING THE ESTIMATED DAILY INTAKE LEVEL WITH THE CANCER POTENCY FACTOR. THESE RISKS ARE PROBABILITIES THAT ARE GENERALLY EXPRESSED IN SCIENTIFIC NOTATION (E.G., $1 \times (10^{-6})$). AN EXCESS LIFETIME CANCER RISK OF $1 \times (10^{-6})$ INDICATES THAT, AS A PLAUSIBLE UPPER BOUND, AN INDIVIDUAL HAS A ONE IN ONE MILLION ADDITIONAL (ABOVE THEIR NORMAL RISK) CHANCE OF DEVELOPING CANCER AS A RESULT OF SITE-RELATED EXPOSURE TO A CARCINOGEN OVER A 70-YEAR LIFETIME UNDER THE ASSUMED SPECIFIC EXPOSURE CONDITIONS AT A SITE.

THE AGENCY CONSIDERS INDIVIDUAL EXCESS CANCER RISKS IN THE RANGE OF $1 \times (10^{-4})$ TO $1 \times (10^{-6})$ AS PROTECTIVE; HOWEVER THE 1×10^{-6} RISK LEVEL IS GENERALLY USED AS THE POINT OF DEPARTURE FOR SETTING CLEANUP LEVELS. AT SUPERFUND SITES. THE POINT OF DEPARTURE RISK LEVEL OF $1 \times (10^{-6})$ EXPRESSES EPA'S PREFERENCE FOR REMEDIAL ACTIONS THAT RESULT IN RISKS AT THE MORE PROTECTIVE END OF THE RISK RANGE.

POTENTIAL CONCERN FOR NONCARCINOGENIC EFFECTS OF A SINGLE CONTAMINANT IN A SINGLE MEDIUM IS EXPRESSED AS THE HAZARD QUOTIENT (HQ) (OR THE RATIO OF THE ESTIMATED INTAKE DERIVED FROM THE CONTAMINANT CONCENTRATION IN A GIVEN MEDIUM TO THE CONTAMINANT'S REFERENCE DOSE). A HQ WHICH EXCEEDS ONE (1) INDICATES THAT THE DAILY INTAKE FROM A SCENARIO EXCEEDS THE CHEMICAL'S REFERENCE DOSE. BY ADDING THE HQs FOR ALL CONTAMINANTS WITHIN A MEDIUM OR ACROSS ALL MEDIA TO WHICH A GIVEN POPULATION MAY REASONABLY BE EXPOSED, THE HAZARD INDEX (HI) CAN BE GENERATED. THE HI PROVIDES A USEFUL REFERENCE POINT FOR GAUGING THE POTENTIAL SIGNIFICANCE OF MULTIPLE CONTAMINANT EXPOSURES WITHIN A SINGLE MEDIUM OR ACROSS MEDIA. AN HI WHICH EXCEEDS UNITY INDICATES THAT THERE MAY BE A CONCERN FOR POTENTIAL HEALTH EFFECTS RESULTING FROM THE CUMULATIVE EXPOSURE TO MULTIPLE CONTAMINANTS WITHIN A SINGLE MEDIUM OR ACROSS MEDIA.

THE HEALTH RISKS RESULTING FROM EXPOSURE TO THE CURRENT PATHWAYS ARE AS FOLLOWS: THE UPPER BOUND EXCESS LIFETIME CANCER RISK ASSOCIATED WITH INHALATION OF AIRBORNE PARTICULATE MATTER WAS $1 \times (10^{-8})$; THE CANCER RISK ASSOCIATED WITH INHALATION OF VOLATILIZED CHEMICALS FROM THE COMBINED SOURCE AREAS WAS $3 \times (10^{-10})$; AND RISK ASSOCIATED WITH INGESTION OF VENISON WAS $2 \times (10^{-10})$. NONE OF THE NON-CARCINOGENIC CHEMICALS OF POTENTIAL CONCERN EXCEEDED A HAZARD QUOTIENT OF ONE (1).

THE FUTURE PATHWAY BASED ON GROUNDWATER CONTAMINATION RESULTING FROM LEACHING OF CONTAMINANTS FROM THE SOIL WAS EVALUATED BY COMPARING THE HEALTH-BASED SOIL CLEANUP LEVELS AND THE SOIL

CONCENTRATION OF THE CONTAMINANTS OF CONCERN IN THE FORMER WASTE MANAGEMENT AREAS. TABLE 5-4 CONTAINS THIS COMPARISON. THE SOIL CLEANUP LEVELS REPRESENT THE RESIDUAL SOIL CONCENTRATIONS THAT WOULD NOT EXCEED THE ACCEPTABLE GROUNDWATER HUMAN HEALTH CONCENTRATIONS FOR A 1×10^{-4} RISK LEVEL AS A RESULT OF THE CONTAMINANTS LEACHING THROUGH THE SOILS TO THE GROUNDWATER.

THE COMPARISON OF THE HEALTH-BASED CLEANUP LEVEL CONCENTRATIONS WITH THE ACTUAL SOIL CONCENTRATIONS INDICATE THAT THE SOILS IN THE FORMER WASTE MANAGEMENT AREAS, WITH THE EXCEPTION OF AREAS 5, 10 AND 11, CONTAIN CONCENTRATIONS OF SITE-RELATED CONTAMINANTS WHICH EXCEED THE HEALTH-PROTECTIVE SOIL LEVELS.

THE FUTURE RISKS ASSOCIATED WITH DIRECT CONTACT BY WORKERS WITH SURFICIAL SOILS IN AREA 2, THE EASTERN PORTION OF AREA 3 AND AREA 9 ARE PRESENTED IN TABLE 5-5. THESE AREAS MAY HAVE SURFICIAL CONTAMINATION.

THE RISK LEVELS IN THIS TABLE REPRESENT THE CUMULATIVE RISKS ASSOCIATED WITH THE INGESTION AND INHALATION EXPOSURE ROUTES. THE CUMULATIVE RISK LEVELS ARE WITHIN THE RISK RANGE OF 1×10^{-4} TO 1×10^{-6} FOR AREAS 2 AND 3. THE RISK LEVEL FOR AREA 9 (1.2×10^{-4}) SLIGHTLY EXCEEDS THE LOWER END OF THE ACCEPTABLE RISK RANGE. THE CUMULATIVE HQS FOR THE DIRECT CONTACT PATHWAY DO NOT EXCEED UNITY FOR THE THREE AREAS OF CONCERN.

THE POTENTIAL CURRENT EXPOSURE PATHWAYS ARE NOT PRODUCING AN UNACCEPTABLE LEVEL OF RISK AND CONSEQUENTLY WILL NOT DRIVE THE REMEDIATION OF THE FORMER WASTE MANAGEMENT AREAS. HOWEVER, SINCE THE SUBSURFACE SOILS ARE EITHER CURRENTLY CONTRIBUTING OR COULD POTENTIALLY CONTRIBUTE IN THE FUTURE TO UNACCEPTABLE LEVELS OF GROUNDWATER CONTAMINATION, THIS PATHWAY WILL DICTATE THE REMEDIATION OF THE CONTAMINATED SUBSURFACE SOILS. ALTHOUGH THE SURFACE SOIL IS NOT CURRENTLY WELL CHARACTERIZED, THE DIRECT CONTACT PATHWAY COULD POTENTIALLY REQUIRE THE REMEDIATION OF SURFACE SOILS, ESPECIALLY IN AREA 2, THE EASTERN PORTION OF AREA 3 AND AREA 9.

5.5 ENVIRONMENTAL RISK

EACH OF THE SOURCE AREAS ARE PRESENTLY EITHER COVERED WITH FILL OR FENCED AND THEREFORE ARE NOT EASILY ACCESSIBLE TO CERTAIN TERRESTRIAL SPECIES. FOR THIS REASON THE SOURCE AREAS ARE NOT EXPECTED TO HAVE TOXIC EFFECTS ON THOSE TERRESTRIAL ANIMALS AT THIS TIME. HOWEVER, THE ECOLOGICAL ASSESSMENT INDICATES THAT THE SITE MAY HAVE TOXIC EFFECTS ON CERTAIN PLANT SPECIES, AS WELL AS ROBINS AND SHREWS IN THE AREAS OF CONCERN IN THE FUTURE. THE SELECTED REMEDY BASED ON HUMAN HEALTH WILL ELIMINATE THE POTENTIAL FOR TOXIC EFFECTS SINCE THE ENVIRONMENTAL EXPOSURE PATHWAYS WILL NOT EXIST. THE ENVIRONMENTAL IMPACT FOR THE BOTTOM DWELLING AQUATIC COMMUNITIES IN JOHNSON CREEK, THE FLOODPLAIN, AND THE TOMBIGBEE RIVER WILL BE FURTHER EVALUATED IN OPERABLE UNIT #3.

5.6 CLEANUP LEVELS

THE SEPTEMBER 1989 ROD FOR OPERABLE UNIT #1, GROUNDWATER REMEDIATION, ADDRESSES THE CONTAMINATED GROUNDWATER EXPOSURE PATHWAY. THE CLEANUP LEVELS OF THE CURRENTLY OPERATING GROUNDWATER PUMP AND TREAT SYSTEM WHICH ENSURES THAT CONCENTRATIONS OF CONTAMINANTS IN THE GROUNDWATER DO NOT EXCEED UNACCEPTABLE RISK LEVELS FOR ANY FUTURE CONSUMERS OF THIS WATER ARE CONTAINED IN TABLE 5-8. THE CLEANUP LEVELS FOR GROUNDWATER IN DEEP SOIL TREATMENT AREAS ARE ALSO CONTAINED IN TABLE 5-8. THE GROUNDWATER CLEANUP LEVELS IN THE DEEP SOIL TREATMENT AREAS HAVE BEEN GENERATED TO ENSURE LOCALIZED ISOLATION AND TREATMENT OF CONTAMINATED GROUNDWATER WHICH EXCEEDS THE HEALTH-BASED GROUNDWATER CLEANUP LEVELS ESTABLISHED AT THE 1×10^{-4} RISK LEVEL. THIS IS CONSISTENT WITH AREAS REQUIRING NO LOCALIZED DEEP SOIL TREATMENT.

THE ROD FOR OPERABLE UNIT #1 DID NOT ADDRESS THE SOURCES OF CONTAMINATION. ADDRESSING THE CONTAMINATION SOURCE WILL DECREASE THE TIME REQUIRED TO PUMP AND TREAT. CLEANUP LEVELS FOR THE

CONTAMINATION SOURCE (THE SUBSURFACE SOILS) FOR GROUNDWATER PROTECTION ARE BASED ON A 1 X (10-4) RISK LEVEL FOR CARCINOGENS AND A HAZARD QUOTIENT OF 1 FOR NONCARCINOGENS. SETTING THE CLEANUP LEVELS FOR SUBSURFACE SOILS AT THE 1 X (10-4) RISK LEVEL IS CONSISTENT WITH THE NCP'S REQUIREMENT FOR ESTABLISHING CLEANUP LEVELS WITHIN THE 1 X (10-4) TO 1 X (10-6) RANGE. THIS CLEANUP LEVEL PROVIDES AN ACCEPTABLE EXPOSURE LEVEL THAT IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT IN AN ISOLATED INDUSTRIAL SETTING. CLEANUP LEVELS FOR CONTAMINATED SURFACE SOIL ARE BASED ON A WORKER EXPOSURE SCENARIO AND ASSUME A COMMERCIAL/INDUSTRIAL LAND USE. THESE LEVELS ARE BASED ON THE INGESTION AND INHALATION EXPOSURE ROUTES AND REPRESENT A 1 X (10-6) RISK LEVEL FOR CARCINOGENS AND A HAZARD QUOTIENT OF 1 FOR NONCARCINOGENS. THE CLEANUP LEVELS FOR GROUNDWATER AND SOILS ARE LISTED IN TABLE 5-8 AND 5-9 RESPECTIVELY.

ALTHOUGH THE CONTAMINANTS OF CONCERN ARE NOT THE ONLY CONTAMINANTS AT THE SITE, THEY WERE CHOSEN BASED ON TOXICITY, MOBILITY AND FREQUENCY OF DETECTION THROUGHOUT THE SITE. IT IS ANTICIPATED THAT CONTAMINANTS AT THE SITE WHICH DO NOT HAVE CLEANUP LEVELS PRESENTED IN THIS ROD WILL BE REDUCED TO ACCEPTABLE LEVELS WHEN CLEANUP LEVELS ARE MET FOR THE MOST TOXIC AND MOST MOBILE CONTAMINANTS FOR WHICH CLEANUP LEVELS HAVE BEEN ESTABLISHED.

THE GROUNDWATER AT THE CIBA-GEIGY SITE CURRENTLY CONTAINS CONCENTRATIONS OF SITE-RELATED CONTAMINANTS AT LEVELS WHICH WOULD POSE AN UNACCEPTABLE RISK (CUMULATIVE RISK IN EXCESS OF 1 X (10-4) TO HUMAN HEALTH IF THE WATER WAS BEING USED FOR HUMAN CONSUMPTION. ACTUAL OR THREATENED RELEASES OF HAZARDOUS SUBSTANCES FROM THIS SITE, IF NOT ADDRESSED BY IMPLEMENTING THE RESPONSE ACTION SELECTED IN THIS ROD, MAY PRESENT AN IMMINENT AND SUBSTANTIAL ENDANGERMENT TO PUBLIC HEALTH, WELFARE, OR THE ENVIRONMENT.

#DA

6.0 DESCRIPTION OF ALTERNATIVES

NINE ALTERNATIVES FOR REMEDIATION OF CONTAMINATED SOILS AT THE CIBA-GEIGY SITE WERE EVALUATED IN THE FEASIBILITY STUDY REPORT AND LISTED IN THE INITIAL PROPOSED PLAN FOR THE SITE. AFTER REVIEWING COMMENTS RECEIVED DURING THE INITIAL COMMENT PERIOD, THE CONCEPTS OF THE NINE ALTERNATIVES WERE REDUCED TO FOUR ALTERNATIVES BASED ON THE SIMILARITIES IN THEIR TECHNOLOGIES. AFTER REVIEWING THE COMMENTS RECEIVED DURING THE COMMENT PERIOD FOR THE AMENDED PROPOSED PLAN AN ADDITIONAL ALTERNATIVE (NUMBER 5) HAS BEEN INCLUDED.

6.1 ALTERNATIVE NO. 1 - NO ACTION

THE NO ACTION ALTERNATIVE IS CARRIED THROUGH THE SCREENING PROCESS AS REQUIRED BY THE NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN (NCP). THIS ALTERNATIVE IS USED AS A BASELINE FOR COMPARISON WITH OTHER ALTERNATIVES THAT ARE DEVELOPED. UNDER THIS ALTERNATIVE, EPA WOULD TAKE NO FURTHER ACTION TO MINIMIZE THE IMPACT SOIL CONTAMINATION WOULD HAVE ON THE GROUNDWATER. CONTAMINANTS IN THE SOIL WOULD CONTINUE TO LEACH INTO THE GROUNDWATER AT LEVELS WHICH WOULD EXCEED GROUNDWATER PROTECTION STANDARDS. THE OVERALL REMEDIAL ACTION LEVELS WOULD NOT BE ACHIEVED WITHIN 100 YEARS BY UTILIZING THIS ALTERNATIVE. THERE IS NO COST ASSOCIATED WITH THIS ALTERNATIVE SINCE NO ADDITIONAL ACTIVITIES WOULD BE CONDUCTED.

6.2 ALTERNATIVE NO. 2 - CONTAINMENT

THIS ALTERNATIVE CONSISTS OF PLACING A SOIL BENTONITE SLURRY WALL AROUND THE PERIMETER OF THE AREA TO PREVENT LATERAL MIGRATION OF CONTAMINANTS IN THE GROUNDWATER. A MULTILAYERED RCRA CAP WOULD BE PLACED OVER THE AREA TO MINIMIZE THE VERTICAL MIGRATION OF SOIL CONTAMINATION. THE AREA WOULD BE REVEGETATED FOLLOWING CONSTRUCTION ACTIVITIES. SOIL CONTAMINATION WOULD NOT BE REDUCED, BUT ISOLATED FROM THE ENVIRONMENT BY THE CAP AND SLURRY WALL. INSTITUTIONAL CONTROLS (LAND AND GROUNDWATER USE RESTRICTIONS) WOULD BE NECESSARY TO ENSURE THE INTEGRITY OF THE ALTERNATIVE. FOLLOWING THE CONSTRUCTION OF THE CAP AND SLURRY WALL, THE SITE WOULD BE MONITORED

TO VERIFY THE EFFECTIVENESS OF THE REMEDY. THE OVERALL REMEDIAL CLEANUP LEVELS AS DEFINED IN OPERABLE UNIT ONE, WOULD NOT BE ACHIEVED WITHIN 100 YEARS BY UTILIZING THIS ALTERNATIVE. THE ALTERNATIVE COULD BE CONSTRUCTED IN 48 MONTHS. THE PRESENT WORTH COST OF THIS ALTERNATIVE, INCLUDING OPERATION AND MAINTENANCE, IS ESTIMATED TO BE \$23,400,000.

ELEMENTS COMMON TO ALTERNATIVES 3, 4 AND 5

ALTERNATIVES 3, 4 AND 5 INVOLVE THE EXCAVATION OF ALL SOIL WHICH EXCEEDS THE HEALTH-BASED CLEANUP LEVELS. ALTHOUGH THE ACTUAL CLEANUP LEVELS ARE NOT APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS), THEY WERE ESTABLISHED, IN PART, TO ENSURE THAT THE FEDERALLY REGULATED DRINKING WATER STANDARDS (IE., MAXIMUM CONTAMINANT LEVELS), WHICH ARE ARARS, ARE NOT EXCEEDED BY THE LEACHING OF CONTAMINATION FROM THE SOILS INTO THE GROUNDWATER. SECTION 121 (D)(4)(C) OF CERCLA PROVIDES THAT AN ARAR MAY BE WAIVED WHEN COMPLIANCE WITH AN ARAR IS TECHNICALLY IMPRACTICABLE FROM AN ENGINEERING PERSPECTIVE. THE WAIVER MAY BE GRANTED IN THE FOLLOWING ALTERNATIVES SHOULD ENGINEERING METHODS NECESSARY TO EXCAVATE THE CONTAMINATED SOIL TO THE CLEANUP LEVELS BE TECHNICALLY IMPRACTICABLE. EPA HAS CONCLUDED THAT IT IS TECHNICALLY IMPRACTICABLE AND LESS COST EFFECTIVE IN THIS CASE TO EXCAVATE TO DEPTHS IN EXCESS OF 20 FEET. THIS IS BASED ON THE DETERMINATION THAT EXCAVATING BENEATH DEPTHS OF 20 FEET WOULD POSE A POTENTIAL FOR CAVE-IN OF THE EXCAVATED AREA. THEREFORE, THE COST OF EXCAVATION DUE TO THE IMPLEMENTATION OF MEASURES TO MINIMIZE THIS HAZARD WOULD BE EXTREMELY HIGH COMPARED TO STANDARD EXCAVATION COST.

FOR AREAS WHERE IT IS TECHNICALLY IMPRACTICABLE TO ACHIEVE THE REMEDIATION LEVEL, INSITU TECHNOLOGIES (I.E., IN-SITU VACUUM EXTRACTION, IN-SITU SOIL WASHING, AND IN-SITU BIOREMEDIATION) WOULD BE EVALUATED DURING THE REMEDIAL DESIGN AND IMPLEMENTED IF PROVEN FEASIBLE. INSTITUTIONAL CONTROLS (I.E., LAND AND GROUNDWATER USE RESTRICTIONS) THAT ARE DETERMINED TO BE NECESSARY TO PRECLUDE THE POTENTIAL FOR EXPOSURE TO THE SUBSURFACE CONTAMINATED SOIL WOULD ALSO BE IMPLEMENTED. IN ADDITION, THE REMAINING ALTERNATIVES MAY REQUIRE A PORTION OF A WAREHOUSE IN AREA 10 TO BE TEMPORARILY REMOVED PRIOR TO EXCAVATION.

6.3 ALTERNATIVE NO. 3 - REMOVAL. STABILIZATION/SOLIDIFICATION, AND ON-SITE DISPOSAL

THIS ALTERNATIVE CONSISTS OF THE EXCAVATION OF CONTAMINATED SOIL AND SLUDGE WITHIN THE SITE UNTIL THE ESTABLISHED CLEANUP LEVELS ARE REACHED OR UNTIL EXCAVATION BECOMES TECHNICALLY IMPRACTICABLE FROM AN ENGINEERING PERSPECTIVE (SEE SECTION 6.2, ELEMENTS COMMON TO ALTERNATIVES 3, 4 AND 5). THE EXCAVATED MATERIAL WOULD BE STABILIZED/SOLIDIFIED. AFTER STABILIZATION/SOLIDIFICATION, THE MATERIAL WOULD BE DISPOSED OF IN AN ON-SITE LANDVAULT AFTER RCRA LDR TREATMENT STANDARDS, PURSUANT TO A TREATABILITY VARIANCE, ARE MET. IN ACCORDANCE WITH SUPERFUND LAND DISPOSAL RESTRICTION (LDR) GUIDANCE #6A, FOR HERBICIDES, WHICH ARE SIMILAR AND ARE APPLICABLE TO SITE CONTAMINANTS, A TREATABILITY VARIANCE REQUIRES THAT THE SELECTED TECHNOLOGY MUST DEMONSTRATE A 90-99.9 PERCENT REDUCTION IN THE CONTAMINANTS OF CONCERN.

UNCERTAINTY EXISTS REGARDING THE EFFECTIVENESS OF STABILIZATION/SOLIDIFICATION OF MATERIAL CONTAMINATED WITH ELEVATED CONCENTRATIONS OF ORGANIC CONTAMINANTS. THEREFORE, TREATABILITY STUDIES WOULD BE CONDUCTED TO DETERMINE THE EFFECTIVENESS OF THIS ALTERNATIVE IN MEETING THE LEGISLATED TREATMENT STANDARDS. STABILIZATION/SOLIDIFICATION WOULD BE UTILIZED FOR SOILS WHERE IT IS PROVEN EFFECTIVE IN REDUCING THE CONTAMINATED SOIL CONCENTRATIONS TO LAND DISPOSAL RESTRICTIONS (LDRS) TREATABILITY VARIANCE LEVELS. THE NCP ESTABLISHES A PRESUMPTION THAT TREATMENT TO THE LEGISLATED STANDARDS BASED ON THE BEST DEMONSTRATED AVAILABLE TECHNOLOGY IS GENERALLY INAPPROPRIATE FOR CERCLA CONTAMINATED SOIL AND DEBRIS (55 FR 8758-62, (MARCH 8, 1990)). THEREFORE, COMPLIANCE WITH THE LAND DISPOSAL TREATMENT STANDARDS WOULD BE ACHIEVED PURSUANT TO A TREATABILITY VARIANCE FOR CERCLA CONTAMINATED SOIL AND DEBRIS WHICH WOULD BE GRANTED UPON ROD SIGNATURE. THE LANDVAULT WOULD BE DESIGNED IN ACCORDANCE WITH APPLICABLE RCRA REGULATIONS. THE AREAS WOULD BE BACKFILLED FOLLOWING EXCAVATION ACTIVITIES. FOLLOWING SITE

REMEDICATION, THE EXCAVATED AREAS WOULD BE VEGETATED. IF THE SUBSURFACE EXCAVATION LEVELS ARE NOT ACHIEVED BECAUSE OF TECHNICAL IMPRACTICABILITY, INSTITUTIONAL CONTROLS (I.E., LAND AND GROUNDWATER USE RESTRICTIONS) WOULD BE NECESSARY TO RESTRICT EXPOSURE TO THE CONTAMINATED SUBSURFACE SOIL. THE OVERALL REMEDIAL ACTION LEVELS WOULD NOT BE ACHIEVED WITHIN 100 YEARS BY UTILIZING THIS ALTERNATIVE. ALTERNATIVE 3 COULD BE CONSTRUCTED IN 48 MONTHS. APPROXIMATELY 127,000 CUBIC YARDS OF MATERIAL WOULD BE STABILIZED/SOLIDIFIED. THE PRESENT WORTH COST OF THIS ALTERNATIVE IS ESTIMATED AT \$41,250,000.

6.4 ALTERNATIVE NO. 4 - REMOVAL, ON-SITE THERMAL TREATMENT, AND ON-SITE DISPOSAL

THIS ALTERNATIVE CONSISTS OF THE EXCAVATION OF CONTAMINATED SLUDGE AND SOIL WITHIN THE SITE UNTIL THE ESTABLISHED CLEANUP LEVELS ARE REACHED OR UNTIL EXCAVATION BECOMES TECHNICALLY IMPRACTICABLE FROM AN ENGINEERING PERSPECTIVE (SEE SECTION 6.2, ELEMENTS COMMON TO ALTERNATIVES 3, 4 AND 5). THE MAJORITY OF THE EXCAVATED MATERIAL WOULD BE TREATED ON-SITE BY THERMAL TREATMENT. TREATABILITY STUDIES WOULD BE CONDUCTED TO DETERMINE THE EFFECTIVENESS OF SOLIDIFICATION/STABILIZATION OF SOILS WITH LOW LEVELS OF CONTAMINATION. STABILIZATION/SOLIDIFICATION WOULD BE UTILIZED FOR SOILS WHERE IT IS PROVEN EFFECTIVE BY THESE TREATABILITY STUDIES IN REDUCING THE CONTAMINATED SOIL CONCENTRATIONS TO LDR TREATABILITY VARIANCE LEVELS.

THE CONTAMINATED SOIL MAY REQUIRE PRE-TREATMENT TO REMOVE DEBRIS (I.E., DRUMS, SCRAP METAL, CONSTRUCTION RUBBLE ETC.) PRESENT BEFORE THE THERMAL TREATMENT PROCESS. AT THE TIME OF EXCAVATION DURING THE REMEDIAL ACTIVITIES, THE DEBRIS WOULD BE REMOVED FROM MATERIAL THAT IS REQUIRED TO BE TREATED. IF DRUMS ARE ENCOUNTERED, THE CONTENTS WOULD BE REMOVED FROM THE DRUMS AND IT WOULD BE TESTED TO DETERMINE IF IT IS HAZARDOUS WASTE. A DETERMINATION WOULD BE MADE BASED ON A METHOD TO BE DETAILED IN THE REMEDIAL DESIGN PHASE OF THE PROJECT AS TO THE HAZARDOUS OR NON-HAZARDOUS NATURE OF THE DEBRIS. IF THE DEBRIS IS DETERMINED TO BE OF A NON-HAZARDOUS NATURE, IT MAY BE DECONTAMINATED AND SEPARATED INTO A CATEGORY OF MATERIALS THAT CAN BE DISPOSED OF OFF-SITE AND/OR RECYCLED. DEBRIS THAT IS DETERMINED TO BE OF A HAZARDOUS NATURE WOULD BE TREATED IN AN APPROPRIATE MANNER TO BE DETERMINED DURING THE REMEDIAL DESIGN.

THE SOILS WITH LOW LEVELS OF CONTAMINATION WOULD UNDERGO STABILIZATION/SOLIDIFICATION. THE SOILS WITH HIGH LEVELS OF CONTAMINATION WOULD BE THERMALLY TREATED. THE SOILS TO BE THERMALLY TREATED WOULD BE BLENDED IN A TANK WHICH MEETS THE DEFINITION OF A TANK IN SECTION 260.10 OF THE CODE OF FEDERAL REGULATIONS (40 CFR). THE PURPOSE OF THE BLENDING IS TO ACHIEVE A HOMOGENEOUS MIXTURE PRIOR TO THERMAL TREATMENT TO ENSURE PROPER THERMAL TREATMENT OPERATIONS AND TO COMPLY WITH OPERATING CONDITIONS DETERMINED IN THE TRIAL BURN. ASH FROM THE THERMAL TREATMENT PROCESS AND ANY SOLIDIFIED/STABILIZED MATERIAL WOULD BE DISPOSED OF IN A LANDVAULT AFTER RCRA LDR TREATMENT STANDARDS, PURSUANT TO A TREATABILITY VARIANCE, ARE MET. IN ACCORDANCE WITH SUPERFUND LDR GUIDANCE #6A, FOR HERBICIDES, WHICH ARE SIMILAR AND APPLICABLE TO SITE CONTAMINANTS, A TREATABILITY VARIANCE REQUIRES THAT THE SELECTED TECHNOLOGY MUST DEMONSTRATE A 90-99.9 PERCENT REDUCTION IN THE CONTAMINANTS OF CONCERN. FOLLOWING EXCAVATION ACTIVITIES, THE AREAS WOULD BE BACKFILLED AND REVEGETATED.

IF THE EXCAVATION LEVELS ARE NOT ACHIEVED BECAUSE OF TECHNICAL IMPRACTICABILITY, THIS ALTERNATIVE WOULD RELY ON NATURAL FLUSHING OF THE CONTAMINATED SOILS BENEATH A DEPTH OF 20 FEET AND REMEDIATION OF THE GROUNDWATER BY THE EXISTING PUMP AND TREAT SYSTEM. OVERALL REMEDIAL ACTION LEVELS WOULD NOT BE ACHIEVED WITHIN 100 YEARS BY UTILIZING THIS ALTERNATIVE. THIS ALTERNATIVE COULD BE IMPLEMENTED IN 7 YEARS. THE PRESENT WORTH COST OF THIS ALTERNATIVE, INCLUDING OPERATION AND MAINTENANCE, WOULD RANGE FROM \$90,000,000, IF SOLIDIFICATION OF SOILS WITH LOW LEVELS OF CONTAMINATION IS PROVEN EFFECTIVE, TO \$116,250,000 FOR COMPLETE INCINERATION OF ALL OF THE CONTAMINATED MATERIAL.

6.5 ALTERNATIVE NO. 5 - REMOVAL, ON-SITE THERMAL TREATMENT, AND ON-SITE DISPOSAL

THIS ALTERNATIVE IS IDENTICAL TO ALTERNATIVE 4 WITH THE FOLLOWING ADDITIONS. THERMAL TREATMENT IN THIS ALTERNATIVE MAY ALSO INCLUDE A PRE-TREATMENT PHASE PRIOR TO THE MAIN THERMAL TREATMENT PROCESS. THREE POTENTIAL PRE-TREATMENT OPTIONS INCLUDE: SOLVENT EXTRACTION, FOLLOWED BY LIQUID INJECTION INCINERATION; LOW TEMPERATURE THERMAL, FOLLOWED BY TREATMENT OF THE DESORBED VOLATILE ORGANICS/AIR MIXTURE; AND CRITICAL FLUID INJECTION, FOLLOWED BY LIQUID INJECTION INCINERATION. THESE OPTIONS FOR PRE-TREATMENT WOULD BE EVALUATED DURING DESIGN TO DETERMINE IF THE MAIN THERMAL TREATMENT PROCESS AND/OR COST EFFECTIVENESS CAN BE ENHANCED WHILE STILL MEETING LEVELS PURSUANT TO THE TREATABILITY VARIANCE. IF ANY OF THE TECHNOLOGIES ARE PROVEN TO ENHANCE COST EFFECTIVENESS OR THE MAIN THERMAL PROCESS, IT WOULD BE USED.

UNDER CERTAIN CIRCUMSTANCES, THE PRE-TREATMENT OPTION COULD TOTALLY REPLACE THE MAIN THERMAL TREATMENT PROCESS. IF ANY OF THE PRE-TREATMENT TECHNOLOGIES ARE PROVEN TO BE MORE EFFECTIVE IN REDUCING THE CONTAMINANT CONCENTRATIONS IN THE SOIL AND IS MORE COST EFFECTIVE, IT WOULD BE USED INSTEAD OF THE MAIN THERMAL TREATMENT PROCESS.

PRE-TREATMENT TECHNOLOGIES THAT WERE NOT EFFECTIVE IN REDUCING CONTAMINATED SOIL CONCENTRATIONS TO LEVELS PURSUANT TO THE TREATABILITY VARIANCE OR DID NOT ENHANCE COST EFFECTIVENESS WOULD NOT BE UTILIZED.

STABILIZATION/SOLIDIFICATION WOULD STILL BE THE PRIMARY TECHNOLOGY FOR THE REMEDIATION OF SOILS WITH LOWER CONTAMINANT LEVELS. TREATABILITY STUDIES WOULD BE CONDUCTED DURING DESIGN TO DETERMINE THE MAXIMUM SOIL CONCENTRATIONS THAT CAN BE TREATED VIA STABILIZATION/SOLIDIFICATION AND STILL ACHIEVE LDR VARIANCE LEVELS. HOWEVER, A NEW, INNOVATIVE CHEMICAL TREATMENT TECHNOLOGY, DECHLORINATION MAY BE TESTED DURING DESIGN AND IF FOUND EFFECTIVE, MAY BE USED INSTEAD OF SOLIDIFICATION FOR SOME LOW LEVEL SOILS. DECHLORINATION USES A BASE (I.E., SODIUM HYDROXIDE) AND AN ORGANIC SOURCE OF HYDROGEN AND A CATALYST TO ACCOMPLISH REDUCTIVE DEHALOGENATION OF HALOGENATED MATERIALS. IF DECHLORINATION IS PROVEN TO BE MORE EFFECTIVE IN REDUCING THE CONTAMINANT CONCENTRATIONS IN THE SOIL AND IS MORE COST EFFECTIVE, IT WOULD BE USED INSTEAD OF THE SOLIDIFICATION/STABILIZATION PROCESS. IF DECHLORINATION IS PROVEN INEFFECTIVE IN REDUCING CONTAMINATED SOIL CONCENTRATIONS TO LEVELS PURSUANT TO THE TREATABILITY VARIANCE AND/OR DOES NOT ENHANCE COST EFFECTIVENESS IT WOULD NOT BE UTILIZED.

THE RESULTS OF THE TREATABILITY STUDIES WOULD BE EVALUATED AND THE TECHNOLOGIES TO BE USED FOR REMEDIATION OF THE CONTAMINATED SOILS WOULD BE DETERMINED AND NOTED IN THE 30 PERCENT REMEDIAL DESIGN REPORT. EPA WOULD THEN ISSUE A PUBLIC NOTICE IN A LOCAL NEWSPAPER AND SEND A FACT SHEET TO PERSONS ON THE MAILING LIST TO INFORM THE PUBLIC OF THE TECHNOLOGIES PROVEN EFFECTIVE AND WHICH ARE TO BE IMPLEMENTED.

ASH FROM THE THERMAL TREATMENT PROCESS, ANY SOLIDIFIED/STABILIZED MATERIAL OR ANY MATERIAL FROM THE DECHLORINATION PROCESS WOULD BE DISPOSED OF IN A LANDVAULT AFTER RCRA LDR TREATMENT STANDARDS, PURSUANT TO A TREATABILITY VARIANCE GRANTED UPON ROD SIGNATURE, ARE MET. IN ACCORDANCE WITH SUPERFUND LDR GUIDANCE #6A, FOR HERBICIDES, WHICH ARE SIMILAR AND APPLICABLE TO SITE CONTAMINANTS, A TREATABILITY VARIANCE REQUIRES THAT THE SELECTED TECHNOLOGY MUST DEMONSTRATE A 90-99.9 PERCENT REDUCTION FOR THE CONTAMINANTS OF CONCERN.

FOLLOWING EXCAVATION ACTIVITIES, THE AREA WOULD BE BACKFILLED AND REVEGETATED. HOWEVER, UNDER THIS ALTERNATIVE, IF CLEANUP LEVELS ARE NOT ACHIEVED BEFORE A DEPTH OF 20 FEET IS REACHED, EXTRACTION WELLS COMBINED WITH ISOLATION WALLS EXTENDING FROM THE LAND SURFACE TO THE TOP OF THE MIOCENE CLAY AND INSITU SOIL FLUSHING WOULD BE UTILIZED TO FLUSH CONTAMINANTS FROM DEEP UNSATURATED SOILS, THUS DECREASING THE TIME REQUIRED TO OPERATE THE PUMP AND TREAT SYSTEM IMPLEMENTED IN OPERABLE UNIT ONE. THE CONTAMINATED GROUNDWATER EXTRACTED BY THESE WELLS WILL BE TREATED BY THE CURRENTLY OPERATING WASTE WATER TREATMENT SYSTEM. INNOVATIVE TECHNOLOGIES (INSITU

VACUUM EXTRACTION OR INSITU BIOREMEDIATION) MAY ALSO BE USED IN CONCERT WITH THE SOIL FLUSHING APPROACH, IF DURING DESIGN THEY ARE FOUND TO BE EFFECTIVE IN REDUCING SOIL CONCENTRATIONS TO EXCAVATION LEVELS. INSTITUTIONAL CONTROLS, SUCH AS DEED RESTRICTIONS, WOULD BE ESTABLISHED TO PRECLUDE USAGE OF GROUNDWATER AND MINIMIZE LAND USE UNTIL ALL CLEANUP LEVELS ARE ACHIEVED.

THIS ALTERNATIVE COULD BE IMPLEMENTED IN 10 YEARS. THE PRESENT WORTH COST OF THIS ALTERNATIVE, INCLUDING OPERATION AND MAINTENANCE, WOULD RANGE FROM \$94,000,000, IF SOLIDIFICATION OF SOILS WITH LOW LEVELS OF CONTAMINATION IS PROVEN EFFECTIVE, TO \$120,250,000 FOR COMPLETE INCINERATION OF ALL OF THE CONTAMINATED MATERIAL.

#SCAA

7.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

THIS SECTION OF THE ROD PROVIDES THE BASIS FOR DETERMINING WHICH ALTERNATIVE PROVIDES THE BEST BALANCE WITH RESPECT TO THE STATUTORY BALANCING CRITERIA IN SECTION 121 OF CERCLA AND IN SECTION 300.430 OF THE NCP. THE MAJOR OBJECTIVE OF THE FS WAS TO DEVELOP, SCREEN, AND EVALUATE ALTERNATIVES FOR THE REMEDIATION OF OPERABLE UNIT TWO AT THE CIBA-GEIGY SITE. A WIDE VARIETY OF TECHNOLOGIES WERE IDENTIFIED AS CANDIDATES FOR REMEDIATING THE CONTAMINATED SOILS AT THE SITE. THESE TECHNOLOGIES WERE SCREENED BASED ON THEIR FEASIBILITY WITH RESPECT TO THE CONTAMINANTS PRESENT AND THE SITE CHARACTERISTICS. THE TECHNOLOGIES THAT REMAINED AFTER THE INITIAL SCREENING WERE COMBINED INTO POTENTIAL REMEDIAL ALTERNATIVES AND EVALUATED IN DETAIL. THE REMEDIAL ALTERNATIVES SELECTED FROM THE SCREENING PROCESS WERE EVALUATED USING THE FOLLOWING NINE EVALUATION CRITERIA:

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT.

COMPLIANCE WITH APPLICABLE AND/OR RELEVANT FEDERAL OR STATE PUBLIC HEALTH OR ENVIRONMENTAL STANDARDS.

LONG-TERM EFFECTIVENESS AND PERMANENCE.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME OF HAZARDOUS SUBSTANCES OR CONTAMINANTS.

SHORT-TERM EFFECTIVENESS, OR THE IMPACTS A REMEDY MIGHT HAVE ON THE COMMUNITY, WORKERS, OR THE ENVIRONMENT DURING THE COURSE OF IMPLEMENTING IT.

IMPLEMENTABILITY, THAT IS, THE ADMINISTRATIVE OR TECHNICAL CAPACITY TO CARRY OUT THE ALTERNATIVE.

COST-EFFECTIVENESS CONSIDERING COSTS FOR CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE ALTERNATIVE OVER THE LIFE OF THE PROJECT, INCLUDING ADDITIONAL COSTS SHOULD IT FAIL.

ACCEPTANCE BY THE STATE.

ACCEPTANCE BY THE COMMUNITY.

THE NCP CATEGORIZES THE NINE CRITERIA INTO THREE GROUPS:

(1) THRESHOLD CRITERIA - OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT AND COMPLIANCE WITH ARARS (OR INVOKING A WAIVER) ARE THRESHOLD CRITERIA THAT MUST BE SATISFIED IN ORDER FOR AN ALTERNATIVE TO BE ELIGIBLE FOR SELECTION;

(2) PRIMARY BALANCING CRITERIA - LONG-TERM EFFECTIVENESS AND PERMANENCE; REDUCTION OF TOXICITY, MOBILITY, OR VOLUME;

SHORT-TERM EFFECTIVENESS; IMPLEMENTABILITY, AND COST ARE PRIMARY BALANCING FACTORS USED TO WEIGH MAJOR TRADE-OFFS AMONG ALTERNATIVE HAZARDOUS WASTE MANAGEMENT STRATEGIES; AND

(3) MODIFYING CRITERIA - STATE AND COMMUNITY ACCEPTANCE ARE MODIFYING CRITERIA THAT ARE FORMALLY TAKEN INTO ACCOUNT AFTER PUBLIC COMMENT IS RECEIVED ON THE PROPOSED PLAN AND INCORPORATED IN THE ROD.

THE SELECTED ALTERNATIVE MUST MEET THE THRESHOLD CRITERIA AND COMPLY WITH ALL ARARS OR BE GRANTED A WAIVER FOR COMPLIANCE WITH ARARS. ANY ALTERNATIVE THAT DOES NOT SATISFY BOTH OF THESE REQUIREMENTS IS NOT ELIGIBLE FOR SELECTION. THE PRIMARY BALANCING CRITERIA ARE THE TECHNICAL CRITERIA UPON WHICH THE DETAILED ANALYSIS IS PRIMARILY BASED. THE FINAL TWO CRITERIA, KNOWN AS MODIFYING CRITERIA, ASSESS THE PUBLIC'S AND THE STATE AGENCY'S ACCEPTANCE OF THE ALTERNATIVE. BASED ON THESE FINAL TWO CRITERIA, EPA MAY MODIFY ASPECTS OF A SPECIFIC ALTERNATIVE.

THE FOLLOWING ANALYSIS IS A SUMMARY OF THE EVALUATION OF ALTERNATIVES FOR REMEDIATING THE CIBA-GEIGY SUPERFUND SITE UNDER EACH OF THE CRITERIA. A COMPARISON IS MADE BETWEEN EACH OF THE ALTERNATIVES FOR ACHIEVEMENT OF A SPECIFIC CRITERION.

THRESHOLD CRITERIA

7.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

ALL OF THE ALTERNATIVES WOULD PROVIDE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT BY MINIMIZING OR CONTROLLING THE RISK ASSOCIATED WITH THE CONTAMINATED SOILS THROUGH TREATMENT OR CONTAINMENT AND INSTITUTIONAL CONTROLS. IN ALTERNATIVE 1, THE CURRENTLY OPERATING GROUNDWATER PUMP AND TREAT SYSTEM WOULD CONTINUE OPERATING. HOWEVER, CONTAMINANTS IN THE SOIL WOULD CONTINUE TO LEACH INTO THE GROUNDWATER AT UNACCEPTABLE LEVELS. CLEANUP LEVELS FOR GROUNDWATER WOULD NOT BE ACHIEVED WITHIN 100 YEARS WITH ALTERNATIVE 1. ALTERNATIVE 2 WOULD ISOLATE THE CONTAMINATION FROM THE SURROUNDING UNCONTAMINATED AREA. THE ALTERNATIVES INVOLVING EXCAVATION, (ALTERNATIVES 3, 4 AND 5), WOULD MINIMIZE THE MAJORITY OF THE RISK BY REMOVING AND TREATING THE PRINCIPAL SOURCE OF THE SOIL AND GROUNDWATER CONTAMINATION AND USE OF INSTITUTIONAL CONTROLS WHERE NECESSARY. HOWEVER, CLEANUP LEVELS FOR THE GROUNDWATER MAY NOT BE ACHIEVED WITHIN 100 YEARS FOR ALTERNATIVES THAT DO NOT INCLUDE DEEP SOIL TREATMENT (ALTERNATIVES 1, 2, 3 AND 4).

ALTERNATIVE 5 WOULD PROVIDE THE BEST OVERALL PROTECTION BECAUSE IT REMOVES AND TREATS THE PRINCIPAL THREATS BETWEEN THE LAND SURFACE AND 20 FEET AND IT PROVIDES DEEP IN-SITU SOIL TREATMENT FOR CONTAMINATED SOILS BELOW 20 FEET.

7.2 COMPLIANCE WITH ARARS

ALL OF THE ALTERNATIVES WOULD COMPLY WITH ALL FEDERAL OR STATE ARARS OR JUSTIFY A WAIVER. CHEMICAL SPECIFIC ARARS WOULD BE MET THROUGH COMPLIANCE WITH THE GROUNDWATER PROTECTION STANDARDS (IE., MCLS) AT THE POINT OF COMPLIANCE AS DEFINED IN CIBA-GEIGY'S RCRA PERMIT AND THROUGH COMPLIANCE WITH THE NPDES PERMIT CONDITIONS FOR WATER REMOVED AND TREATED IN THE WASTE MANAGEMENT AREAS. THE LANDVAULT UTILIZED IN ALTERNATIVES 3, 4 AND 5 WOULD BE DESIGNED IN ACCORDANCE WITH RCRA REGULATIONS. SOILS EXCAVATED IN ALTERNATIVES 3, 4 AND 5 WOULD BE ANALYZED TO DETERMINE IF THEY ARE RCRA HAZARDOUS WASTE. IF REQUIRED, RCRA HAZARDOUS WASTE WOULD BE TREATED TO LEGISLATED TREATMENT STANDARDS PURSUANT TO A TREATABILITY VARIANCE PRIOR TO LAND DISPOSAL. HIGHLY CONCENTRATED SOILS WOULD BE TREATED BY A THERMAL TREATMENT PROCESS DESIGNED TO COMPLY WITH RCRA REGULATIONS FOR HAZARDOUS WASTE THERMAL TREATMENT. IT IS NOT ANTICIPATED ALTERNATIVE 3 WOULD ACHIEVE THESE STANDARDS FOR MANY OF THE CONTAMINANTS OF CONCERN DUE TO THE ELEVATED LEVELS PRESENT IN THE CONTAMINATED SOIL. ALTERNATIVES 4 AND 5 ARE DESIGNED TO ATTAIN THESE STANDARDS PURSUANT TO THE TREATABILITY VARIANCE.

AIR EMISSIONS FROM THE SITE WOULD BE MONITORED TO ENSURE COMPLIANCE WITH THE CLEAN AIR ACT. FENCELINE AIR MONITORING WILL BE CONDUCTED TO ENSURE THAT CONTAMINANT CONCENTRATIONS DO NOT EXCEED LEVELS CONSIDERED TO BE SAFE FOR HUMAN HEALTH. IF LEVELS ARE EXCEEDED, MITIGATIVE PROCEDURES SUCH AS DUST SUPPRESSION OR VAPOR CAPTURE WILL BE EMPLOYED TO PREVENT HARMFUL LEVELS OF AIR EMISSIONS FROM LEAVING THE SITE. RCRA DESIGN STANDARDS WILL BE INCORPORATED INTO THE REMEDIAL DESIGN OF ALL REMEDIAL ACTIVITIES.

PRIMARY BALANCING CRITERIA

7.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

ALTERNATIVE 1 WOULD NOT PROVIDE LONG-TERM EFFECTIVENESS AND PERMANENCE WITH RESPECT TO THE CONTAMINATED SOILS AT THE SITE. EACH OF THE REMAINING ALTERNATIVES WOULD PROVIDE LONG-TERM EFFECTIVENESS THROUGH LIMITING THE MIGRATION OF CONTAMINATION OR TREATMENT OF THE CONTAMINATED SOILS AT THE SITE. OVER TIME THE EFFECTIVENESS OF ALTERNATIVE 2 MAY DECREASE AS A RESULT OF CAP/SLURRY WALL FAILURE CAUSED BY IMPROPER CONSTRUCTION (I.E., KEYING OF THE WALL INTO AN UNFRACTURED IMPERMEABLE CLAY LAYER) OR INADEQUATE OPERATION AND MAINTENANCE PROCEDURES. HOWEVER, AS LONG AS THE CAP AND SLURRY WALL ARE PROPERLY MAINTAINED, THE ALTERNATIVE COULD BE EFFECTIVE. IN ALTERNATIVE 3, THE CONTAMINANTS ARE BOUND TO THE SOIL BY THE TREATMENT PROCESS AND THE SOLIDIFIED MATERIAL IS CONTAINED ON-SITE IN A RCRA LANDFILL. THE LONG-TERM EFFECTIVENESS OF ALTERNATIVE 3 IS UNCERTAIN SINCE SOLIDIFYING HIGH LEVEL ORGANIC CONTAMINATION HAS NOT BEEN DEMONSTRATED TO BE EFFECTIVE IN PREVENTING LEACHING OF THE WASTE INTO THE GROUNDWATER. ALTERNATIVES 4 AND 5 PROVIDE A GREATER LEVEL OF LONG-TERM EFFECTIVENESS THAN ALTERNATIVES 2 AND 3 BECAUSE THERMAL TREATMENT HAS BEEN DEMONSTRATED TO EFFECTIVELY DESTROY CONTAMINANTS TO THE LEVELS ALLOWED BY THE TREATABILITY VARIANCE. ALTERNATIVE 5 PROVIDES THE GREATEST LONG-TERM EFFECTIVENESS AND PERMANENCE BY THE ADDITIONAL TREATMENT OF CONTAMINATED SOILS BELOW 20 FEET.

7.4 REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT

ALTERNATIVE 1 WOULD NOT REDUCE MOBILITY, TOXICITY OR VOLUME AT THE SOURCE OF THE CONTAMINATION. ALTERNATIVE 2 WOULD ISOLATE THE CONTAMINATION FROM THE ENVIRONMENT, THUS MINIMIZING THE FORCES WHICH DRIVE CONTAMINANT MOBILITY. HOWEVER, TOXICITY AND VOLUME WOULD NOT BE AFFECTED BY ALTERNATIVE 2. EACH OF THE REMAINING ALTERNATIVES WOULD REDUCE THE MOBILITY OF THE CONTAMINANTS THROUGH TREATMENT. TREATABILITY STUDIES WOULD BE CONDUCTED TO DEMONSTRATE THE LEVEL OF MOBILITY REDUCTION RESULTING IN THE STABILIZATION/SOLIDIFICATION PROCESS PROPOSED IN ALTERNATIVE 3. HOWEVER, THE VOLUME OF CONTAMINATED MATERIAL IN ALTERNATIVE 3 WOULD INCREASE DUE TO THE STABILIZATION PROCESS. ALTERNATIVE 3 WOULD PROVIDE MINIMAL REDUCTION IN TOXICITY. THE TOXICITY OF CHEMICAL CONTAMINANTS AT THE SITE WOULD BE REDUCED BY THE THERMAL DESTRUCTION PROCESS IN ALTERNATIVES 4 AND 5. THERMAL TREATMENT AND DESTRUCTION OF THE ORGANIC CHEMICAL CONTAMINANTS AT THE SITE THROUGH ALTERNATIVES 4 AND 5 WOULD VIRTUALLY ELIMINATE ALL TOXIC EFFECTS OF THE EXCAVATED SOILS ALONG WITH A SUBSTANTIAL REDUCTION IN VOLUME. ALTERNATIVE 5 PROVIDES THE BEST REDUCTION OF TOXICITY AND MOBILITY THROUGH TREATMENT BY UTILIZING INNOVATIVE IN-SITU TREATMENTS FOR CONTAMINATED SOILS BELOW 20 FEET.

7.5 SHORT-TERM EFFECTIVENESS

ALTERNATIVE 1 WOULD NOT REQUIRE CONSTRUCTION OR EXCAVATION THAT WOULD CAUSE A HEALTH RISK TO WORKERS. HOWEVER, ALTERNATIVE 1 WOULD BE THE LEAST EFFECTIVE IN ACHIEVING THE OVERALL GROUNDWATER CLEANUP LEVELS IN THE SHORTEST TIME PERIOD. ALL OF THE REMAINING ALTERNATIVES WILL REQUIRE VARYING AMOUNTS OF TIME TO IMPLEMENT. NONE WILL BE IMMEDIATELY EFFECTIVE. NO THRESHOLD TOXICITY CRITERIA WOULD BE EXCEEDED BY IMPLEMENTING ALTERNATIVES 2, 3, 4, AND 5 AND THE HEALTH RISKS TO REMEDIAL WORKERS IS UNLIKELY, PARTICULARLY WHEN APPROPRIATE MONITORING AND ENGINEERING CONTROLS ARE APPLIED. OF THE ALTERNATIVES EVALUATED, ALTERNATIVES 3, 4 AND 5 ARE MORE EFFECTIVE THAN ALTERNATIVE 2 BECAUSE CONTAMINATED SOIL WOULD BE REMOVED AND TREATED. ALTHOUGH

ALTERNATIVES 3 AND 4 REQUIRE REMOVAL OF CONTAMINATED SOILS DOWN TO 20 FEET, ALTERNATIVE 5 WOULD BE MOST EFFECTIVE IN THE SHORT-TERM BY ISOLATING AND TREATING THE CONTAMINATED SOILS BELOW 20 FEET. THESE SOILS ARE CAUSING THE MOST IMMEDIATE THREAT BECAUSE OF THEIR PROXIMITY TO THE GROUNDWATER.

7.6 IMPLEMENTABILITY

THE NO ACTION ALTERNATIVE IS CURRENTLY OPERATING. TECHNOLOGICAL EXPERTISE, SERVICES, EQUIPMENT AND MATERIALS ARE ADEQUATELY AVAILABLE FOR THE IMPLEMENTATION OF ALTERNATIVE 2. THE TECHNICAL IMPRACTICABILITY WAIVER FOR THE EXCAVATION OF SOILS MAY BE GRANTED IF THE REGIONAL ADMINISTRATOR DETERMINES IT NECESSARY FOR ALTERNATIVES 3, 4 AND 5. DUE TO THE UNCERTAINTY REGARDING THE EFFECTIVENESS OF STABILIZATION/SOLIDIFICATION OF MATERIAL CONTAMINATED WITH ELEVATED CONCENTRATIONS OF ORGANIC CONTAMINANTS A TREATABILITY STUDY WOULD BE CONDUCTED. A DETERMINATION WOULD BE MADE AT THE COMPLETION OF THE TREATABILITY STUDIES, TO BE CONDUCTED DURING THE REMEDIAL DESIGN, REGARDING THE EFFECTIVENESS OF STABILIZATION/SOLIDIFICATION OF MATERIAL CONTAMINATED WITH ELEVATED CONCENTRATIONS OF ORGANIC CONTAMINANTS.

THERMAL TREATMENT CAPACITY MAY BE LIMITED AT THE TIME OF IMPLEMENTATION OF ALTERNATIVES 4 AND 5. NEW EQUIPMENT MAY HAVE TO BE DESIGNED AND CONSTRUCTED AS A PART OF THE OVERALL SCHEDULE. HOWEVER, THE TECHNOLOGY BASE DOES EXIST FOR THE COMPLETION OF THIS REQUIREMENT. ASH FROM THE THERMAL TREATMENT PROCESS, ANY SOLIDIFIED/STABILIZED MATERIAL OR ANY MATERIAL FROM THE DECHLORINATION PROCESS WOULD BE DISPOSED OF IN A LANDVAULT AFTER RCRA LEGISLATED TREATMENT STANDARDS, THROUGH A TREATABILITY VARIANCE GRANTED UPON ROD SIGNATURE, ARE MET. IN ACCORDANCE WITH SUPERFUND LDR GUIDANCE #6A, FOR HERBICIDES, WHICH ARE SIMILAR AND APPLICABLE TO SITE CONTAMINANTS, THE SELECTED TECHNOLOGY MUST DEMONSTRATE A 90-99.9 PERCENT REDUCTION FOR THE CONTAMINANTS OF CONCERN TO BE GRANTED THE VARIANCE. ALL OF THE ALTERNATIVES ARE TECHNICALLY AND ADMINISTRATIVELY FEASIBLE. HOWEVER, THE RESULTS OF THE TREATABILITY STUDIES WOULD DETERMINE THE EFFECTIVENESS OF ALTERNATIVE 3 ON ELEVATED LEVELS OF ORGANICS.

7.7 COST

ALTERNATIVE 1 WOULD NOT REQUIRE ANY ADDITIONAL COST SINCE NO TREATMENT OF THE SOURCE IS PROVIDED. THE PRESENT WORTH COST OF INSTALLING A SLURRY WALL AND CAP (ALTERNATIVE 2) IS ESTIMATED TO BE \$23,404,000. ALTERNATIVES 3, 4 AND 5 ARE SUBSTANTIALLY HIGHER IN COST DUE TO INCREASED EFFORTS TO PERMANENTLY TREAT THE CONTAMINATED SOIL. THE PRESENT WORTH COST ASSOCIATED WITH STABILIZATION AND SOLIDIFICATION OF THE CONTAMINATED SOIL (ALTERNATIVE 3) IS \$41,250,000. THERMAL TREATMENT AND/OR SOLIDIFICATION/STABILIZATION OF THE CONTAMINANTS IN THE SOIL (ALTERNATIVE 4) WOULD COST APPROXIMATELY \$90,000,000 IF SOLIDIFICATION/STABILIZATION OF SOILS WITH LOW LEVELS OF CONCENTRATION IS PROVEN EFFECTIVE TO \$116,250,000 FOR COMPLETE INCINERATION OF ALL THE CONTAMINATED MATERIAL. THE COST FOR THERMAL TREATMENT AND/OR SOLIDIFICATION/STABILIZATION OF THE CONTAMINANTS IN THE EXCAVATED SOIL COMBINED WITH DEEP SOIL TREATMENT OF CONTAMINATED AREAS BELOW 20 FEET, (ALTERNATIVE 5), WOULD RANGE FROM APPROXIMATELY \$94,000,000 IF SOLIDIFICATION/STABILIZATION OF SOILS WITH LOW LEVELS OF CONCENTRATION IS PROVEN EFFECTIVE TO \$120,250,000 FOR COMPLETE INCINERATION OF ALL THE CONTAMINATED

MATERIAL. THE TREATABILITY STUDY WOULD BE CONDUCTED DURING THE REMEDIAL DESIGN TO VERIFY THE LEVEL OF CONTAMINATION WHICH COULD BE SOLIDIFIED/STABILIZED AND STILL ACHIEVE RCRA LAND DISPOSAL STANDARDS PURSUANT TO A TREATABILITY VARIANCE. THESE COSTS INCLUDE OPERATION AND MAINTENANCE DURING THE IMPLEMENTATION OF THE ALTERNATIVE AS WELL AS POST REMEDIATION MONITORING.

MODIFYING CRITERIA

7.8 STATE ACCEPTANCE

THE STATE OF ALABAMA HAS CONCURRED WITH THE SELECTION OF ALTERNATIVE 5 TO REMEDIATE THE CONTAMINATED SOIL AT THE CIBA-GEIGY SITE.

7.9 COMMUNITY ACCEPTANCE

BASED ON THE FAVORABLE COMMENTS EXPRESSED AT THE AUGUST 1990 PUBLIC MEETING AND THE LACK OF WRITTEN COMMENTS RECEIVED DURING THE COMMENT PERIODS, IT APPEARS THAT THE MCINTOSH COMMUNITY GENERALLY AGREES WITH THE SELECTED REMEDY.

#SSR

8.0 SUMMARY OF SELECTED REMEDY

IN SUMMARY, ALTERNATIVE 5 WILL ACHIEVE SUBSTANTIAL RISK REDUCTION THROUGH TREATMENT OF THE PRINCIPAL THREAT AT THE CIBA-GEIGY SUPERFUND SITE. LDR TREATMENT STANDARDS WILL BE ACHIEVED, PURSUANT TO A TREATABILITY VARIANCE, GRANTED UPON ROD SIGNATURE, PRIOR TO PLACING THE TREATED EXCAVATED MATERIAL IN THE ON-SITE LANDVAULT. AS SHOWN IN FIGURE 4, THE TREATMENT TECHNOLOGY WHICH HAS BEEN DEMONSTRATED TO ACHIEVE THESE STANDARDS FOR THE RCRA WASTES PRESENT AT THE SITE IS THERMAL TREATMENT. THERMAL TREATMENT IN THIS ALTERNATIVE MAY ALSO INCLUDE A PRE-TREATMENT PHASE PRIOR TO THE MAIN THERMAL TREATMENT PROCESS. THREE POTENTIAL PRE-TREATMENT OPTIONS INCLUDE: SOLVENT EXTRACTION, FOLLOWED BY LIQUID INJECTION INCINERATION; LOW TEMPERATURE THERMAL, FOLLOWED BY TREATMENT OF THE DESORBED VOLATILE ORGANICS/AIR MIXTURE; AND CRITICAL FLUID INJECTION, FOLLOWED BY LIQUID INJECTION INCINERATION. THESE OPTIONS FOR PRE-TREATMENT WILL BE EVALUATED DURING TREATABILITY STUDIES TO BE CONDUCTED DURING THE REMEDIAL DESIGN TO DETERMINE IF THE MAIN THERMAL TREATMENT PROCESS AND/OR COST EFFECTIVENESS CAN BE ENHANCED WHILE STILL MEETING LEVELS PURSUANT TO THE TREATABILITY VARIANCE. IF ANY OF THE TECHNOLOGIES ARE PROVEN TO ENHANCE COST EFFECTIVENESS OR THE MAIN THERMAL PROCESS, IT WILL BE USED.

UNDER CERTAIN CIRCUMSTANCES, THE PRE-TREATMENT OPTION COULD TOTALLY REPLACE THE MAIN THERMAL TREATMENT PROCESS. IF ANY OF THE PRE-TREATMENT TECHNOLOGIES ARE PROVEN TO BE MORE EFFECTIVE IN REDUCING THE CONTAMINANT CONCENTRATIONS IN THE SOIL AND IS MORE COST EFFECTIVE, IT WILL BE USED INSTEAD OF THE MAIN THERMAL TREATMENT PROCESS. PRE-TREATMENT TECHNOLOGIES THAT ARE NOT FOUND TO BE EFFECTIVE IN REDUCING CONTAMINATED SOIL CONCENTRATIONS TO LEVELS PURSUANT TO THE TREATABILITY VARIANCE OR DO NOT ENHANCE COST EFFECTIVENESS WILL NOT BE UTILIZED.

TREATABILITY STUDIES WILL BE CONDUCTED TO DETERMINE THE EFFECTIVENESS OF SOLIDIFICATION/STABILIZATION OF SOILS WITH LOW LEVELS OF CONTAMINATION. STABILIZATION/SOLIDIFICATION WILL BE UTILIZED FOR SOILS WHERE IT IS PROVEN EFFECTIVE BY THESE TREATABILITY STUDIES IN REDUCING THE CONTAMINATED SOIL CONCENTRATIONS TO LDR TREATABILITY VARIANCE LEVELS. HOWEVER, A NEW INNOVATIVE CHEMICAL TREATMENT TECHNOLOGY, DECHLORINATION MAY BE TESTED DURING DESIGN AND, IF FOUND EFFECTIVE, MAY BE USED INSTEAD OF SOLIDIFICATION/STABILIZATION FOR SOME LOW LEVEL SOILS.

DECHLORINATION USES A BASE (I.E., SODIUM HYDROXIDE) AND AN ORGANIC SOURCE OF HYDROGEN AND A CATALYST TO ACCOMPLISH REDUCTIVE DEHALOGENATION OF HALOGENATED MATERIALS. IF DECHLORINATION IS PROVEN TO BE MORE EFFECTIVE IN REDUCING THE CONTAMINANT CONCENTRATIONS IN THE SOIL AND IS MORE COST EFFECTIVE, IT WILL BE USED INSTEAD OF THE SOLIDIFICATION/STABILIZATION PROCESS. IF DECHLORINATION IS PROVEN INEFFECTIVE IN REDUCING CONTAMINATED SOIL CONCENTRATIONS TO LEVELS PURSUANT TO THE TREATABILITY VARIANCE AND/OR DOES NOT ENHANCE COST EFFECTIVENESS IT WILL NOT BE UTILIZED.

THE CONTAMINATED SOIL MAY REQUIRE PRE-TREATMENT TO REMOVE DEBRIS (I.E., DRUMS, SCRAP METAL, CONSTRUCTION RUBBLE ETC.) PRESENT BEFORE THE THERMAL TREATMENT PROCESS. AT THE TIME OF EXCAVATION DURING THE REMEDIAL ACTIVITIES, THE DEBRIS MAY BE REMOVED FROM MATERIAL THAT IS REQUIRED TO BE TREATED. IF DRUMS ARE ENCOUNTERED, THE CONTENTS WILL BE REMOVED FROM THE DRUMS AND IT WILL BE TESTED TO DETERMINE IF IT IS HAZARDOUS WASTE. A DETERMINATION WILL BE MADE BASED

ON A METHOD TO BE DETAILED IN THE REMEDIAL DESIGN PHASE OF THE PROJECT AS TO THE HAZARDOUS OR NON-HAZARDOUS NATURE OF THE DEBRIS. IF THE DEBRIS IS DETERMINED TO BE OF A NON-HAZARDOUS NATURE, IT MAY BE DECONTAMINATED AND SEPARATED INTO A CATEGORY OF MATERIALS THAT CAN BE DISPOSED OF OFF-SITE AND/OR RECYCLED. DEBRIS THAT IS DETERMINED TO BE OF A HAZARDOUS NATURE WILL BE TREATED IN AN APPROPRIATE MANNER TO BE DETERMINED AT THE TIME OF EXCAVATION. THE SOILS WITH LOW LEVELS OF CONTAMINATION WILL UNDERGO STABILIZATION/SOLIDIFICATION. THE SOILS WITH HIGH LEVELS OF CONTAMINATION WILL BE THERMALLY TREATED. THE SOILS TO BE THERMALLY TREATED WOULD BE BLENDED IN A TANK WHICH MEETS THE DEFINITION OF A TANK IN SECTION 260.10 OF THE CODE OF FEDERAL REGULATIONS (40 CFR). THE PURPOSE OF THE BLENDING IS TO ACHIEVE A HOMOGENEOUS MIXTURE PRIOR TO THERMAL TREATMENT TO ENSURE PROPER THERMAL TREATMENT OPERATIONS AND TO COMPLY WITH OPERATING CONDITIONS DETERMINED IN THE TRIAL BURN. ASH FROM THE THERMAL TREATMENT PROCESS, ANY SOLIDIFIED/STABILIZED MATERIAL OR ANY MATERIAL FROM THE DECHLORINATION PROCESS WILL BE DISPOSED OF IN A LANDVAULT AFTER RCRA LDR TREATMENT STANDARDS, PURSUANT TO A TREATABILITY VARIANCE GRANTED UPON ROD SIGNATURE, ARE MET. IN ACCORDANCE WITH SUPERFUND LDR GUIDANCE #6A, FOR HERBICIDES, WHICH ARE SIMILAR AND APPLICABLE TO SITE CONTAMINANTS, A TREATABILITY VARIANCE REQUIRES THAT THE SELECTED TECHNOLOGY MUST DEMONSTRATE A 90-99.9 PERCENT REDUCTION IN THE CONTAMINANTS OF CONCERN.

IN ORDER TO PROVIDE A CONSTANT TREATMENT CRITERION THROUGHOUT THE REMEDIATION PROCESS WHICH WILL ENSURE COMPLIANCE WITH THE TREATABILITY VARIANCE, THE CONCENTRATION OF EACH CONTAMINANT OF CONCERN IN THE SOIL AFTER TREATMENT MUST BE NO GREATER THAN 10 PERCENT OF THE CORRESPONDING CLEANUP LEVEL. ADHERENCE TO THIS CRITERION WILL ENSURE A MINIMUM OF 90 PERCENT REDUCTION AS REQUIRED BY THE TREATABILITY VARIANCE. REQUIRING THAT TREATED SOILS CONTAIN A CONCENTRATION LESS THAN OR EQUAL TO A 90 PERCENT REDUCTION OF THE CLEANUP LEVELS HAS BEEN PURSUANT TO ASSUMING THAT THE CLEANUP LEVELS ARE THE LOWEST CONCENTRATIONS OF SOILS THAT WILL BE EXCAVATED. ENSURING THAT THE CLEANUP LEVELS ARE REDUCED BY 90 PERCENT (LEAVING A MAXIMUM OF 10 PERCENT) COMPLIES WITH THE LOWER LIMIT OF THE PERCENTAGE REDUCTION ALLOWED BY SUPERFUND LDR GUIDANCE 6A. IN ADDITION TO PROVIDING A CONSTANT TREATMENT LEVEL, THE SOIL BEFORE TREATMENT WILL NOT HAVE TO BE ANALYZED OTHER THAN FOR PROCESS CONTROL.

IN SOME CASES (I.E., IF GAMMA-BHC IS FOUND AT 1000 MG/KG BEFORE TREATMENT, REQUIRING THAT IT BE REDUCED TO 0.1 MG/KG, SEE TABLE 8-1, THIS WILL BE A 99.99 PERCENT REDUCTION) THE TREATABILITY VARIANCE STANDARDS MAY BE MORE STRINGENT THAN THE UPPER LIMIT IN SUPERFUND LDR GUIDANCE #6A (99.9 PERCENT), HOWEVER IT WILL REMAIN LESS STRINGENT THAN THE LDR STANDARDS FOR THE CONTAMINANTS OF CONCERN [I.E., BHCS = .066 MG/KG DDTs = .087 MG/KG). IN THESE CASES, THE TREATABILITY VARIANCE WILL STILL BE APPLIED.

TABLE 8-1 PROVIDES THE TREATABILITY VARIANCE TREATMENT LEVELS FOR THE CONTAMINANTS OF CONCERN THAT MUST BE ACHIEVED PRIOR TO PLACEMENT OF TREATED SOILS INTO THE RCRA LANDVAULT.

CONFIRMATORY SAMPLES WILL BE CONDUCTED DURING THE REMEDIAL DESIGN TO ENSURE THAT CONTAMINATION IS NOT PRESENT ABOVE LEVELS PURSUANT TO THE ROD FOR SURFACE AND SUBSURFACE SOILS. IF CONFIRMATORY SAMPLES INDICATE THAT CONCENTRATIONS OF SUBSURFACE SOILS ARE ABOVE SURFACE CLEANUP LEVELS, INSTITUTIONAL CONTROLS, INCLUDING DEED RESTRICTIONS AND/OR OTHER MEASURES NECESSARY WILL BE UTILIZED TO ENSURE THAT ANY FUTURE EXCAVATIONS OF THE CONTAMINATED SOIL WILL INCLUDE THE SAME HANDLING AND TREATMENT AS SET OUT IN THE SELECTED REMEDY.

FOLLOWING EXCAVATION ACTIVITIES, THE AREA WILL BE BACKFILLED AND REVEGETATED. AS PRESENTED IN FIGURE 5 (FLOW CHART), IF CLEANUP LEVELS ARE NOT ACHIEVED BEFORE A DEPTH OF 20 FEET IS REACHED, EXTRACTION WELLS COMBINED WITH ISOLATION WALLS EXTENDING FROM THE LAND SURFACE TO THE TOP OF THE MIOCENE CLAY AND INSITU SOIL FLUSHING WILL BE UTILIZED TO FLUSH CONTAMINANTS FROM DEEP UNSATURATED SOILS, THUS DECREASING THE TIME REQUIRED TO OPERATE THE PUMP AND TREAT SYSTEM IMPLEMENTED IN OPERABLE UNIT ONE. THE CONTAMINATED GROUNDWATER EXTRACTED BY THESE WELLS WILL BE TREATED BY THE CURRENTLY OPERATING WASTE WATER TREATMENT SYSTEM. INNOVATIVE TECHNOLOGIES (INSITU

VACUUM EXTRACTION OR INSITU BIOREMEDIATION) MAY ALSO BE USED IN CONCERT WITH THE SOIL FLUSHING APPROACH, IF DURING DESIGN THEY ARE FOUND TO BE EFFECTIVE IN REDUCING SOIL CONCENTRATIONS TO CLEANUP LEVELS. INSTITUTIONAL CONTROLS, SUCH AS DEED RESTRICTIONS, WILL BE ESTABLISHED TO PRECLUDE USAGE OF GROUNDWATER AND MINIMIZE LAND USE UNTIL CLEANUP LEVELS ARE ACHIEVED.

THE RESULTS OF THE TREATABILITY STUDIES FOR ALL TECHNOLOGIES TESTED DURING THE REMEDIAL DESIGN WILL BE EVALUATED AND THE TECHNOLOGIES TO BE USED FOR REMEDIATION OF THE CONTAMINATED SOILS WOULD BE DETERMINED AND NOTED IN THE 30 PERCENT REMEDIAL DESIGN REPORT. EPA WILL THEN ISSUE A PUBLIC NOTICE IN A LOCAL NEWSPAPER AND SEND A FACT SHEET TO PERSONS ON THE MAILING LIST TO INFORM THE PUBLIC OF THE TECHNOLOGIES PROVEN EFFECTIVE AND WHICH ARE TO BE IMPLEMENTED.

AIR EMISSIONS FROM THE SITE WILL BE MONITORED TO ENSURE COMPLIANCE WITH THE CLEAN AIR ACT. FENCELINE AIR MONITORING WILL BE CONDUCTED TO ENSURE THAT CONTAMINANT CONCENTRATIONS DO NOT EXCEED LEVELS CONSIDERED TO BE SAFE FOR HUMAN HEALTH. IF LEVELS ARE EXCEEDED, MITIGATIVE PROCEDURES SUCH AS DUST SUPPRESSION OR VAPOR CAPTURE WILL BE EMPLOYED TO PREVENT HARMFUL LEVELS OF AIR EMISSIONS FROM LEAVING THE SITE.

ALL TREATED WASTES WILL BE LAND DISPOSED IN ACCORDANCE WITH THE SUBSTANTIVE REQUIREMENTS OF THE LAND BAN REGULATIONS, PURSUANT TO SECTION 3004 OF THE RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA), AS AMENDED BY THE HAZARDOUS AND SOLID WASTE AMENDMENTS OF 1984 (HSWA). AFTER EXCAVATION AND TREATMENT, TREATED WASTES WILL BE LAND DISPOSED WHEN LDR TREATMENT STANDARDS FOR ANY CHARACTERISTIC WASTE, LISTED WASTE, OR REGULATED HAZARDOUS CONSTITUENT PURSUANT TO A TREATABILITY VARIANCE GRANTED UPON ROD SIGNATURE ARE MET. THE TREATMENT STANDARDS ARE BASED ON THE PERFORMANCE OF TREATMENT TECHNOLOGIES DETERMINED BY THE AGENCY TO REPRESENT BEST DEMONSTRATED AVAILABLE TECHNOLOGY (BDAT) AS PROMULGATED ON JUNE 1, 1990. WASTES THAT, AS TREATED, CONTAIN RCRA HAZARDOUS WASTES OR HAZARDOUS WASTE CONSTITUENTS, AT CONCENTRATIONS WHICH DO NOT EXCEED THE TREATMENT STANDARDS, ARE NOT RESTRICTED FROM LAND DISPOSAL UNITS.

THE SELECTED ALTERNATIVE FOR THE CIBA-GEIGY SITE IS CONSISTENT WITH THE REQUIREMENTS OF SECTION 121 OF CERCLA AND THE NATIONAL CONTINGENCY PLAN. THE SELECTED ALTERNATIVE WILL REDUCE THE MOBILITY, TOXICITY, AND VOLUME OF CONTAMINATED SOIL AT THE SITE. IN ADDITION, THE SELECTED ALTERNATIVE IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, WILL ATTAIN ALL FEDERAL AND STATE APPLICABLE OR RELEVANT AND APPROPRIATE PUBLIC HEALTH AND ENVIRONMENTAL REQUIREMENTS THROUGH A TECHNICAL IMPRACTICABILITY WAIVER LIMITING EXCAVATION DEPTHS TO 20 FEET AND A LDR TREATABILITY VARIANCE, IS COST-EFFECTIVE AND UTILIZES PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE. THE SELECTED ALTERNATIVE FOR OPERABLE UNIT NO. 2 IS CONSISTENT WITH PREVIOUS REMEDIAL ACTIONS CONDUCTED AT THE SITE.

BASED ON THE INFORMATION AVAILABLE AT THIS TIME, THE SELECTED ALTERNATIVE REPRESENTS THE BEST BALANCE AMONG THE CRITERIA USED TO EVALUATE REMEDIES. ALTERNATIVE 5 IS BELIEVED TO BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, WILL ATTAIN ARARS (THROUGH APPLICATION OF THE TREATABILITY VARIANCE), WOULD BE COST EFFECTIVE, AND WOULD UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE.

#SD

9.0 STATUTORY DETERMINATION

UNDER ITS LEGAL AUTHORITIES, EPA'S PRIMARY RESPONSIBILITY AT SUPERFUND SITES IS TO UNDERTAKE REMEDIAL ACTIONS THAT ACHIEVE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. IN ADDITION, SECTION 121 OF CERCLA ESTABLISHES SEVERAL OTHER STATUTORY REQUIREMENTS AND PREFERENCES. THESE SPECIFY THAT, WHEN COMPLETE, THE SELECTED REMEDIAL ACTION FOR THIS SITE MUST COMPLY WITH APPLICABLE OR RELEVANT AND APPROPRIATE ENVIRONMENTAL STANDARDS ESTABLISHED UNDER FEDERAL AND STATE ENVIRONMENTAL LAWS UNLESS A STATUTORY WAIVER IS JUSTIFIED. THE SELECTED

REMEDY ALSO MUST BE COST-EFFECTIVE AND UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE. FINALLY, THE STATUTE INCLUDES A PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE VOLUME, TOXICITY, OR MOBILITY OF HAZARDOUS WASTES AS THEIR PRINCIPAL ELEMENT. THE FOLLOWING SECTIONS DISCUSS HOW THE SELECTED REMEDY MEETS THESE STATUTORY REQUIREMENTS.

9.1 PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT

THE SELECTED REMEDY PROTECTS HUMAN HEALTH AND THE ENVIRONMENT THROUGH TREATING A PRINCIPAL THREAT REMAINING AT THE SITE, THE CONTAMINATED SOILS AT TEN OF ELEVEN FORMER WASTE MANAGEMENT AREAS ADDRESSED IN THIS ROD. THE SELECTED REMEDY PROVIDES PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT BY ELIMINATING, REDUCING, OR CONTROLLING RISK THROUGH TREATMENT, ENGINEERING CONTROLS AND/OR INSTITUTIONAL CONTROLS.

9.2 ATTAINMENT OF THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

REMEDIAL ACTIONS PERFORMED UNDER CERCLA MUST COMPLY WITH ALL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS). ALL ALTERNATIVES CONSIDERED FOR THE CIBA-GEIGY SITE WERE EVALUATED ON THE BASIS OF THE DEGREE TO WHICH THEY COMPLIED WITH THESE REQUIREMENTS. THE SELECTED REMEDY WAS FOUND TO MEET OR EXCEED THE FOLLOWING ARARS, AS DISCUSSED BELOW.

CLEAN WATER ACT

PERCHED WATER AT CERTAIN AREAS AND STORMWATER WHICH CONTACTS SITE MATERIALS DURING REMEDIATION ACTIVITIES WILL BE ROUTED THROUGH THE EXISTING ON-SITE WASTEWATER TREATMENT PLANT. IN ADDITION, CONTAMINATED GROUNDWATER EXTRACTED BY THE DEEP SOIL TREATMENT TECHNOLOGIES AND THE CURRENT PUMP AND TREAT SYSTEM, LEACHATE FROM THE LANDVAULT AND INCINERATOR SCRUBBER WATER WILL BE TREATED BEFORE DISCHARGE INTO THE TOMBIGBEE RIVER THROUGH THE CURRENT NPDES PERMIT. ALL CURRENT DISCHARGE LIMITATIONS WILL REMAIN IN EFFECT FOR THE TOTAL FACILITY DISCHARGE. THIS INCLUDES CHEMICAL-SPECIFIC EFFLUENT LIMITATIONS BASED IN THE ORGANIC CHEMICALS, PLASTICS, AND SYNTHETIC FIBERS (OCPSF) GUIDELINES, AS WELL AS THE BIOMONITORING REQUIREMENTS TO EVALUATE COMPLIANCE WITH TOXICITY REQUIREMENTS.

RESOURCE CONSERVATION AND RECOVERY ACT

MANY RCRA REQUIREMENTS ARE CONSIDERED RELEVANT AND APPROPRIATE FOR REMEDIAL ACTIVITIES PROPOSED AT THE MCINTOSH PLANT. THE EXCAVATED SOILS AND SLUDGES WILL BE REPRESENTATIVELY ANALYZED TO DETERMINE IF THEY ARE RCRA HAZARDOUS WASTES. IF RCRA HAZARDOUS WASTE IS FOUND IT WILL BE DISPOSED OF IN A LANDVAULT AFTER RCA LEGISLATED TREATMENT STANDARDS PURSUANT TO A TREATABILITY VARIANCE, GRANTED UPON ROD SIGNATURE, ARE MET. EP TOXICITY AND TCLP ANALYSES WILL BE PERFORMED TO ENSURE THAT TREATMENT STANDARDS, THROUGH A TREATABILITY VARIANCE, ARE MET. A PILOT STUDY AND A TRIAL BURN WILL BE REQUIRED TO ENSURE THAT THE INCINERATOR WILL MEET THE DESTRUCTION REMOVAL EFFICIENCIES FOR THE CONTAMINANTS AT THE SITE. THE PRIMARY ACTIVITIES INCLUDE CONSTRUCTION OF ISOLATION WALLS, CONSTRUCTION OF ONE OR MORE NEW LANDVAULTS, STABILIZATION/SOLIDIFICATION, INCINERATION, GROUNDWATER PUMP AND TREAT, AND POSSIBLY OTHER INNOVATIVE TECHNOLOGIES. RCA DESIGN STANDARDS WILL BE INCORPORATED INTO THE REMEDIAL DESIGN OF ALL CONSTRUCTION ACTIVITIES SO THAT THE SUBSTANTIVE REQUIREMENTS OF ALL APPLICABLE RCA REGULATIONS ARE MET .

OTHER GUIDANCE TO BE CONSIDERED

OTHER GUIDANCE TO BE CONSIDERED (TBGS) INCLUDE HEALTH BASED ADVISORIES AND GUIDANCE. TBGS HAVE BEEN UTILIZED IN ESTIMATING INCREMENTAL CANCER RISK NUMBERS FOR REMEDIAL ACTIVITIES AT THE SITES. THE RISK NUMBERS ARE EVALUATED RELATIVE TO THE NORMALLY ACCEPTED POINT OF DEPARTURE RISK

RANGE OF $1 \times (10^{-4})$ TO $1 \times (10^{-6})$.

CLEAN AIR ACT

AIR EMISSIONS FROM THE REMEDIAL ACTIVITIES AT THE SITE, INCLUDING THERMAL TREATMENT, WOULD BE MONITORED TO ENSURE COMPLIANCE WITH THE SUBSTANTIVE REQUIREMENTS OF THE CLEAN AIR ACT. FENCELINE AIR MONITORING WILL BE CONDUCTED TO ENSURE THAT CONTAMINANT CONCENTRATIONS DO NOT EXCEED LEVELS CONSIDERED TO BE SAFE FOR HUMAN HEALTH. IF LEVELS ARE EXCEEDED, MITIGATIVE PROCEDURES SUCH AS DUST SUPPRESSION OR VAPOR CAPTURE WILL BE EMPLOYED TO PREVENT HARMFUL LEVELS OF AIR EMISSIONS FROM LEAVING THE SITE.

CHEMICAL-SPECIFIC ARARS

MAXIMUM CONTAMINANT LEVELS (MCLS) AND NON-ZERO MCLGS ARE THE GROUNDWATER PROTECTION STANDARDS SET OUT IN THE CORRECTIVE ACTION PROGRAM REQUIRED BY THE 1985 RCA PART B PERMIT. THOSE STANDARDS HAVE BEEN INCORPORATED INTO THE CERCLA ROD (SEPTEMBER, 1989) FOR THE FIRST OPERABLE UNIT, ADDRESSING THE ALLUVIAL AQUIFER, AND ARE INDICATED IN TABLE 5-8.

WAIVERS

SECTION 121 (D)(4)(C) OF CERCLA PROVIDES THAT AN ARAR MAY BE WAIVED WHEN COMPLIANCE WITH AN ARAR IS TECHNICALLY IMPRACTICABLE FROM AN ENGINEERING PERSPECTIVE. THE WAIVER IS GRANTED FOR THE SELECTED ALTERNATIVE SHOULD ENGINEERING METHODS NECESSARY TO EXCAVATE THE CONTAMINATED SOIL TO THE CLEANUP LEVELS BE TECHNICALLY IMPRACTICABLE. EPA HAS CONCLUDED THAT IT IS TECHNICALLY IMPRACTICABLE AND LESS COST EFFECTIVE IN THIS CASE TO EXCAVATE TO DEPTHS IN EXCESS OF 20 FEET. THIS IS BASED ON THE DETERMINATION THAT EXCAVATING BENEATH DEPTHS OF 20 FEET WOULD POSE A POTENTIAL FOR CAVE-IN OF THE EXCAVATED AREA. THEREFORE, THE COST OF EXCAVATION DUE TO THE IMPLEMENTATION OF MEASURES TO MINIMIZE THIS HAZARD WOULD BE EXTREMELY HIGH COMPARED TO STANDARD EXCAVATION COST.

THE SELECTED ALTERNATIVE WILL COMPLY WITH THE LDRS THROUGH A TREATABILITY VARIANCE FOR THE CONTAMINATED SOIL AND DEBRIS.

9.3 COST EFFECTIVENESS

THE ESTIMATED COST OF EPA'S SELECTED REMEDY IS BETWEEN \$94,000,000 AND \$124,250,000. THIS RANGE IS DEPENDS ON THE AMOUNT OF MATERIAL THAT CAN BE TREATED BY STABILIZATION/SOLIDIFICATION WITH THE HIGHER COST ASSUMING THAT ALL MATERIAL WILL BE THERMALLY TREATED. COST EFFECTIVENESS IS DETERMINED BY COMPARING THE COST OF ALL ALTERNATIVES BEING CONSIDERED WITH THEIR OVERALL EFFECTIVENESS TO DETERMINE WHETHER THE COSTS ARE PROPORTIONAL TO THE EFFECTIVENESS ACHIEVED. EPA EVALUATES THE INCREMENTAL COST OF EACH ALTERNATIVE AS COMPARED TO THE INCREASED EFFECTIVENESS OF THE REMEDY. THE SELECTED REMEDY, ALTERNATIVE 5, ALTHOUGH MOST COSTLY, WAS CHOSEN FOR ITS HIGH DEGREE OF EFFECTIVENESS AT REDUCING THE MOBILITY, TOXICITY, AND VOLUME OF THE CONTAMINANTS AND ITS LONG-TERM PROTECTIVENESS. EPA HAS DETERMINED THAT THE COST OF THE SELECTED REMEDY ARE PROPORTIONAL TO THE OVERALL EFFECTIVENESS; THEREFORE, THE REMEDY IS CONSIDERED COST EFFECTIVE.

9.4 UTILIZATION OF PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

EPA BELIEVES THE SELECTED REMEDY IS THE MOST APPROPRIATE CLEANUP SOLUTION FOR THE CIBA-GEIGY SITE AND PROVIDES THE BEST BALANCE AMONG THE EVALUATION CRITERIA FOR THE REMEDIAL ALTERNATIVES EVALUATED. THIS REMEDY PROVIDES EFFECTIVE PROTECTION IN BOTH THE SHORT-TERM AND LONG-TERM TO POTENTIAL HUMAN AND ENVIRONMENTAL RECEPTORS, IS IMPLEMENTABLE, AND IS COST-EFFECTIVE.

THERMAL TREATMENT, OF THE HIGHLY CONTAMINATED SOILS WITH PRE-TREATMENT OPTIONS PROVEN EFFECTIVE DURING THE DESIGN AND STABILIZATION/SOLIDIFICATION OR DECHLORINATION OF LOW LEVEL CONTAMINATED SOIL, IF PROVEN EFFECTIVE DURING THE DESIGN, WITH LANDVAULT DISPOSAL OF THE RESIDUALS WILL EFFECTIVELY REDUCE AND/OR ELIMINATE THE MOBILITY OF HAZARDOUS WASTE AND HAZARDOUS SUBSTANCES TO THE ENVIRONMENT. ISOLATION FROM THE GROUNDWATER COMBINED WITH IN-SITU TREATMENT OF ANY CONTAMINATED SOILS BELOW 20 FEET WILL EFFECTIVELY REDUCE AND/OR ELIMINATE THE MOBILITY OF HAZARDOUS WASTE AND HAZARDOUS SUBSTANCES TO THE ENVIRONMENT.

9.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

THE STATUTORY PREFERENCE FOR TREATMENT WILL BE MET BECAUSE THE SELECTED REMEDY TREATS THE HIGHLY CONTAMINATED AND MOST MOBILE CONTAMINATED SOILS, A PRINCIPAL THREAT POSED BY THE SITE, AND ISOLATES AND TREATS THE LOWER CONTAMINATED SOILS.

#DSC

10.0 DOCUMENTATION OF SIGNIFICANT CHANGES

THE PROPOSED PLAN RELEASED FOR PUBLIC COMMENT ON JULY 30, 1990, IDENTIFIED NINE POSSIBLE ALTERNATIVES FOR REMEDIATION OF CONTAMINATED SOILS AT THE ELEVEN FORMER WASTE MANAGEMENT AREAS AT THE SITE. THE PROPOSED PLAN ALSO IDENTIFIED A COMBINATION OF TECHNOLOGIES INCLUDING: REMOVAL, ON-SITE THERMAL TREATMENT; STABILIZATION AND SOLIDIFICATION; AND/OR CONTAINMENT (LANDVAULT) AS THE PREFERRED ALTERNATIVE FOR REMEDIATION OF THE ELEVEN CONTAMINATED SOIL AREAS AT THE CIBA-GEIGY SITE. AFTER REVIEWING COMMENTS RECEIVED DURING THE INITIAL COMMENT PERIOD, THE CONCEPTS IN THE NINE ALTERNATIVES WERE REDUCED TO FOUR ALTERNATIVES BASED ON THE SIMILARITIES IN THEIR TECHNOLOGIES. THESE FOUR ALTERNATIVES WERE PRESENTED IN THE FEBRUARY 1991 AMENDED PROPOSED PLAN.

AFTER REVIEWING THE COMMENTS RECEIVED DURING THE COMMENT PERIOD FOR THE AMENDED PROPOSED PLAN, AN ADDITIONAL ALTERNATIVE WHICH RELIES ON THERMAL DESTRUCTION AS THE PRIMARY REMEDY BUT ALLOWS THE FLEXIBILITY TO CONDUCT TREATABILITY STUDIES FOR FOUR INNOVATIVE EX-SITU TREATMENT TECHNOLOGIES (SOLVENT EXTRACTION, LOW TEMPERATURE THERMAL, CRITICAL FLUID INJECTION AND DECHLORINATION) DURING THE REMEDIAL DESIGN HAS BEEN INCLUDED. THESE CHANGES WERE PUBLISHED IN THE JULY 1991 MODIFICATION TO THE AMENDED PROPOSED PLAN. IN ADDITION, ALTERNATIVE 5 INCLUDED IN-SITU TREATMENT IN AREAS WHERE THE CLEANUP LEVELS WOULD NOT BE ACHIEVED AT 20 FEET. SOIL FLUSHING COMBINED WITH ISOLATION WALLS AND EXTRACTION WELLS WOULD BE THE PRIMARY MEANS OF TREATMENT. HOWEVER, INNOVATIVE TECHNOLOGIES (IN-SITU VACUUM EXTRACTION AND IN-SITU BIOREMEDIATION) WOULD ALSO BE USED IF DURING DESIGN THEY ARE FOUND TO BE EFFECTIVE IN REDUCING SOIL CONCENTRATIONS.

EPA ALSO DECIDED TO DEFER ITS DECISION ON AREA 8 (FIG. 1), WHICH HAS LARGE BOULDERS AND SCRAP METALS MIXED WITH THE CONTAMINATED SOILS. THE CHEMICALS OF CONCERN IN AREA 8 INCLUDE A VARIETY OF VOLATILE ORGANIC COMPOUNDS AT HIGH CONCENTRATIONS (I.E., TOLUENE, XYLENE) WHICH ARE NOT PRESENT IN OTHER AREAS. AREA 8 IS PARTIALLY LOCATED WITHIN A BLUFFLINE CONSTRUCTED UNDER THE SUPERVISION OF THE UNITED STATES CORPS OF ENGINEERS AND IT IS ADJACENT TO THE FLOODPLAIN WHICH IS CURRENTLY UNDERGOING RI/FS ACTIVITIES. THIS AREA WILL BE ADDRESSED IN A FUTURE OPERABLE UNIT.

CLEAN-UP LEVELS FOR SOILS WERE NOT CLEARLY PRESENTED IN THE INITIAL PROPOSED PLAN. IN THE FEBRUARY 1991 AMENDED PROPOSED PLAN, EPA PRESENTED SOIL EXCAVATION LEVELS FOR THE CONTAMINANTS OF CONCERN WHICH WOULD MINIMIZE THE IMPACT CONTAMINANTS LEACHING FROM THE SOIL WOULD HAVE ON THE GROUNDWATER. THE RISK BASED EXCAVATION LEVELS AS DEVELOPED FOR THE PROTECTION OF GROUNDWATER WERE CALCULATED TO BE 80 PPM TOTAL PESTICIDES AND 20 PPM TOTAL BHC ISOMERS. BASED ON THESE LEVELS, IT WAS ESTIMATED THAT AN ADDITIONAL 114,880 CUBIC YARDS OF CONTAMINATED SOIL WOULD BE EXCAVATED AND TREATED. BASED ON COMMENTS RECEIVED DURING THE COMMENT PERIOD, THE TOTAL REVISED

ESTIMATED VOLUME OF CONTAMINATED MATERIAL WAS 202,000 CUBIC YARDS. AFTER REVIEWING THE COMMENTS RECEIVED DURING THE COMMENT PERIOD FOR THE FEBRUARY 1991 AMENDED PROPOSED PLAN, THE MODELING USED BY EPA TO DETERMINE SOIL CLEANUP LEVELS HAVE BEEN MODIFIED.

THE JULY 1991 MODIFICATION TO THE AMENDED PROPOSED PLAN INCLUDES TWO SETS OF CLEANUP LEVELS, ONE FOR THE SURFACE SOILS AND ONE FOR THE SUBSURFACE SOILS. THE HEALTH-BASED SUBSURFACE SOIL CLEANUP LEVELS WERE CALCULATED USING EITHER THE PESTAN OR SUMMERS MODELS UTILIZING SITE SPECIFIC SOIL-WATER PARTITIONING COEFFICIENTS. THE PESTAN AND SUMMERS MODELS WERE USED TO ESTIMATE GROUNDWATER CONTAMINANT CONCENTRATIONS WHICH RESULT FROM MIGRATION OF CONTAMINANTS THROUGH THE SOIL COLUMN. THE PESTAN MODEL WAS USED IN AREAS WHERE AN UNCONTAMINATED ZONE EXISTS BETWEEN THE CONTAMINATED SOIL AND THE GROUNDWATER SURFACE (AREAS 2, 3, 5, 6, 7, 10 AND 11). THE SUMMERS MODEL WAS USED IN AREAS WHERE CONTAMINATION HAS EXTENDED TO OR NEAR THE GROUNDWATER (AREAS 1, 4 AND 9). THE MODIFIED SURFACE SOIL CLEANUP LEVELS, WHICH WILL APPLY TO THE TOP TWELVE (12) INCHES THROUGHOUT THE AREAS OF CONTAMINATION, HAVE BEEN DEVELOPED BASED ON A DIRECT CONTACT PATHWAY FOR A FUTURE WORKER EXPOSURE SCENARIO AND ASSUME A COMMERCIAL/INDUSTRIAL LAND USE. NO EXCAVATION WOULD BE REQUIRED IN AREAS WHERE THE CONCENTRATIONS OF THE CONTAMINANTS OF CONCERN ARE BELOW THE CLEANUP LEVELS. THE CLEANUP LEVELS WERE ADOPTED IN THE FINAL SELECTED REMEDY.

IN THE FEBRUARY 1991 AMENDED PROPOSED PLAN, EPA HAD REQUIRED SITE EXCAVATION UNTIL THE DEPTH WHERE "TECHNICAL IMPRACTICABILITY" PREVENTED FURTHER EXCAVATION. EPA PREVIOUSLY DEFINED "TECHNICAL IMPRACTICABILITY" FOR SOIL EXCAVATION AS WHEN GROUNDWATER WAS ENCOUNTERED. FOLLOWING A REVIEW OF COMMENTS RECEIVED DURING THE COMMENT PERIOD, EPA HAS LIMITED THE PRACTICABILITY OF EXCAVATION TO DEPTHS LESS THAN 20 FEET. EXCAVATING BENEATH DEPTHS OF 20 FEET WOULD POSE A POTENTIAL FOR CAVE-IN OF THE EXCAVATED AREA. IN ADDITION, THE COST OF EXCAVATION DUE TO THE IMPLEMENTATION OF MEASURES TO MINIMIZE THIS HAZARD COULD BE EXTREMELY HIGH COMPARED TO STANDARD EXCAVATION COST.

RCRA CAPS AND SLURRY WALLS WERE ALSO A PART OF THE INITIAL ALTERNATIVE. IF CLEANUP LEVELS ARE REACHED, SLURRY WALLS OR RCRA 1 CAPS WILL NOT BE REQUIRED TO MINIMIZE THE IMPACT TO THE GROUNDWATER. THE SELECTED ALTERNATIVE REQUIRES AN ISOLATION WALL IN CONCERT WITH LOCALIZED GROUNDWATER EXTRACTION AND TREATMENT SYSTEM AND INSITU TECHNOLOGIES TO BE EVALUATED DURING THE REMEDIAL DESIGN, IN THE EVENT THAT CLEANUP LEVELS ARE NOT ACHIEVED BEFORE AN EXCAVATION DEPTH OF 20 FEET IS REACHED.

THE SCOPE OF THE INDIVIDUAL OPERABLE UNITS HAS ALSO BEEN REFINED AND A FOURTH OPERABLE UNIT, WAS ADDED AS FOLLOWS.

- OU #1 CONTAMINATION OF THE SHALLOW (ALLUVIAL) GROUNDWATER AQUIFER.
- OU #2 CONTAMINATION OF SOILS AT TEN OF ELEVEN FORMER WASTE MANAGEMENT AREAS.
- OU #3 CONTAMINATION WITHIN THE FLOODPLAIN, THE LOWER PORTION OF THE DILUTE DITCH AND AREAS IN THE TOMBIGBEE RIVER WITHIN CLOSE PROXIMITY TO THE SITE.
- OU #4 CONTAMINATION OF SOILS IN FORMER WASTE MANAGEMENT AREA 8 AND THE UPPER PORTION OF THE DILUTE DITCH.

#TA

TABLE 4-2

**SOILS AREA-WIDE - ANALYTES DETECTED
FOR THE SELECTED CONTAMINANTS OF CONCERN**

ANALYTES	CONCENTRATIONS (MG/KG)			DETECTION
	MINIMUM	MEDIAN	MAXIMUM	FREQUENCY
VOLATILE ORGANICS				
BENZENE	BMDL	0.331	5650	32 - 94
CHLOROBENZENE	BMDL	0.129	414	49 - 94
CHLOROFORM	0.0067	0.372	16600	18 - 94
TOLUENE	BMDL	0.267	6360	38 - 94
PESTICIDES/PCBS				
4,4'-DDD	BMDL	15.8	8590	50 - 89
	25.6			
4,4'-DDE 0.255	15.7	8410	40 - 89	
	17.8			
4,4'-DDT	BMDL	29.6	3780	41 - 89
ALPHA-BHC	BMDL	BMDL	4370	34 - 89
BETA-BHC	BMDL	5.13	751	19 - 89
DELTA-BHC	BMDL	2.16	315	15 - 89
GAMMA-BHC	BMDL	BMDL	753	14 - 89
	BMDL			
MANUFACTURED PESTICIDES				
CHLOROBENZILATE	BMDL	BMDL	650	34 - 94
DIAZINON	BMDL	2.3	786	36 - 94
METALS				
LEAD	BMDL	14	180	91 - 91

* BMDL WHEN A COMPOUND OR ELEMENT IS PRESENT BELOW ITS PUBLISHED MDL (IT IS REPORTED AS BMDL (BELOW METHOD DETECTION LIMIT))

* MDL THE PRIORITY POLLUTANT COMPOUNDS AND ELEMENTS ARE LISTED WITH THEIR NPDES NUMBERS AND THE METHOD DETECTION LIMIT (MDL) PUBLISHED IN THE FEDERAL REGISTER

DETECTION FREQUENCY - THE NUMBER OF TIMES A CONTAMINANT WAS FOUND WITH RESPECT TO THE NUMBER OF TIMES IT WAS ANALYZED FOR (I.E., 32-94 MEANS THE CONTAMINANT WAS FOUND IN 32 OF 94 SAMPLES)

TABLE 5-8

THE FOLLOWING GROUNDWATER CLEANUP LEVELS ARE BEING APPLIED AT THE PROPERTY BOUNDARY FOR GROUNDWATER LEAVING THE SITE TO ENSURE THAT ANY FUTURE GROUNDWATER CONSUMERS WILL NOT BE EXPOSED TO UNACCEPTABLE CONCENTRATIONS OF SITE-RELATED CHEMICALS IN THE GROUNDWATER. THE CONCENTRATIONS PRESENTED REPRESENT EITHER THE REGULATED MAXIMUM CONTAMINANT LEVEL (MCL) OR THE MINIMUM DETECTION LEVEL FOR THE CONSTITUENTS LISTED.

GROUNDWATER CLEANUP LEVELS
AS PROVIDED IN ROD ADDRESSING OU #1

CONTAMINANTS	CLEANUP GOAL (UG/L)
ANILINE	10
ARSENIC	50
BENZENE	5
ALPHA-BHC	.05
GAMMA-BHC	0.2
CARBON TETRACHLORIDE	5
CHLOROBENZENE	5
CHLOROFORM	5
CRESOLS (M-P-)	10
METHYL ETHYL KETONE	10
NAPTHALENE	10
TOLUENE	2000

THE FOLLOWING GROUNDWATER CLEANUP LEVELS WOULD BE APPLIED TO ANY GROUNDWATER WITHDRAWAL WELLS INSTALLED WITHIN THE RCRA DEFINED POINT OF COMPLIANCE OR WITHIN THE AREAS IDENTIFIED FOR EACH OF THE ELEVEN IDENTIFIED AREAS. THE WITHDRAWAL WELLS WOULD BE INSTALLED IN AREAS WHERE SUBSURFACE SOIL CLEANUP LEVELS WERE NOT ACHIEVED.

GROUNDWATER CLEANUP LEVELS FOR DEEP SOIL TREATMENT AREAS

COMPOUND	CLEANUP LEVEL (UG/L)
ALPHA-BHC	0.6
BETA-BHC	2.0
LINDANE	0.2
DELTA-BHC	0.2
DDT	10.0
DDD	10.0
DDE	10.0
DIAZINON	6.0
CHLOROBENZILATE	140.0

TABLE 5.9

**DIRECT CONTACT SOIL CLEANUP LEVELS FOR OU #2
AT THE CIBA-GEIGY SITE**

THE FOLLOWING TABLE PROVIDES THE DIRECT CONTACT CLEANUP LEVELS. THESE LEVELS WILL BE APPLIED TO THE TOP 12 INCHES OF SOIL THROUGHOUT THE AREAS OF CONTAMINATION.

CONTAMINANT	1E-6 RISK
	DIRECT CONTACT PATHWAY (MG/KG)
DDT	17
DDD	24
DDE	17
ALPHA-BHC	1.0
BETA-BHC	3.0
DELTA-BHC	2.0
GAMMA-BHC	4.0
*CHLOROBENZILATE	39,922
*DIAZINON	1,796

**SUBSURFACE SOIL CLEANUP LEVELS FOR OU #2
DUE TO GROUNDWATER INGESTION PATHWAY**

THE SUBSURFACE SOIL CLEANUP LEVELS HAVE BEEN GENERATED AT THE 1E-4 RISK LEVEL AND ARE PRESENTED BELOW. THE SUMMERS MODEL WILL BE APPLIED TO AREAS 1, 4 AND 9 AND THE PESTAN MODEL WILL BE APPLIED TO AREAS 2, 3, 5, 6, 7, 10 AND 11.

CONTAMINANT	SUMMER'S (MG/KG)	PESTAN (MG/KG)
DDT	5,034	7,500
DDD	6,758	7,500
DDE	16,527	17,250
ALPHA-BHC	4.0	156
BETA-BHC	17	152
DELTA-BHC	3	154
GAMMA-BHC	1.0	37
*CHLOROBENZILATE	209	340
*DIAZINON	10	10

* THIS CHEMICAL IS NOT CONSIDERED TO BE A CARCINOGEN. THEREFORE, THE CLEANUP LEVELS DO NOT REPRESENT A CARCINOGENIC RISK LEVEL. THE CLEANUP LEVEL FOR THIS CHEMICAL REPRESENTS A CONCENTRATION WHICH, WHEN COMBINED WITH THE SITE SPECIFIC EXPOSURE ASSUMPTIONS, WILL YIELD A DAILY INTAKE WHICH DOES NOT EXCEED THE CHEMICAL'S REFERENCE DOSE (RFD). THE RFD IS AN ESTIMATE OF THE LIFETIME DAILY EXPOSURE LEVEL FOR HUMANS, INCLUDING SENSITIVE INDIVIDUALS, WHICH WILL NOT PRODUCE ADVERSE HEALTH EFFECTS.

TABLE 8-1

TREATMENT STANDARD FOR SOILS AT THE CIBA-GEIGY SITE

THE FOLLOWING TABLE PROVIDES THE MAXIMUM CONCENTRATION ALLOWED IN THE RESIDUALS AFTER TREATMENT FOR THE CONTAMINANTS OF CONCERN.

CONTAMINANT	MAXIMUM CONCENTRATION	
	ALLOWED AFTER TREATMENT (MG/KG)	
DDT	503	
DDD	675	
DDE	1,653	
ALPHA-BHC	0.4	
BETA-BHC	1.7	
DELTA-BHC	0.3	
GAMMA-BHC	0.1	
CHLOROBENZILATE	20.9	
DIAZINON	1.0	